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# USSR Report

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BIOMEDICAL AND BEHAVIORAL SCIENCES

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5 December 1984

**USSR REPORT  
LIFE SCIENCES  
BIOMEDICAL AND BEHAVIORAL SCIENCES**

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AEROSPACE MEDICINE

IMPACT OF SPACE MEDICINE ON EARTH-BASED MEDICINE--ACADEMICIAN YE. I. CHAZOV  
COMMENTS ON THE WORK IN ORBIT OF PHYSICIAN O. AT'KOV

Leningrad LENINGRADSKAYA PRAVDA in Russian 23 Aug 84 p 3

[Article by A. Romanov, TASS special correspondent, Mission Control Center,  
dateline 22 Aug 84]

[Text] The cosmonaut-researcher, physician Oleg At'kov has been working for 196 days aboard the Salyut-1--Soyuz T-11 complex. Together with commander Leonid Kizim and flight engineer Vladimir Solov'yev, he is an active participant in the general program of the mission. But his principal duties are related to medical research. This was elaborated by the Institute of Biomedical Problems and All-Union Cardiological Research Center.

The general director of this center, Yevgeniy Ivanovich Chazov, made the following statements in a meeting with reporters:

"Space medicine is a young science. The prominent scientist, V. V. Parin said that medical research in space will have an appreciable impact on medicine on earth. It is known how important the problem of learning the patterns of function of the cardiovascular system is to mankind. This is expressly the subject of many experiments in space. It is important for scientists to find out how space factors affect the cardiovascular system, investigate the process of adaptation of a living organism to weightlessness, accelerations at lift-off and return of cosmonauts to earth."

For many years, space medicine used the data that had been obtained by cosmonauts who were not specialists in this field. A physician had taken off for the second time to orbit the earth. And he was not simply a physician, but a cardiologist. He observed first hand how his own body adjusted to weightlessness, as well as his fellow travelers and members of the visiting crew, Vladimir Dzhanibekov, Svetlana Savitskaya and Igor' Volk. From the data we received from orbit it can be concluded that the research pursued in this direction by Oleg At'kov is of special scientific and practical value for the future.

There is another important aspect to the matter. "It is known," Ye. I. Chazov continued, "that physical exercises in orbit are necessary to maintain the cosmonauts' cardiovascular and skeletomuscular system in a condition that would not cause problems for them upon returning to earth. At the same time,

physical exercise takes up much of the crew's time, so that they are detracted from scientific research work for long periods. Oleg At'kov is presently examining which exercises are the most desirable and to what extent they should be performed. Upon returning to earth, these studies will help formulate even more precisely a scientifically validated work and living schedule for cosmonauts when they are away from earth."

The second part of the program of this mission, if it can be so stated, consists of scientific problems related to use of space conditions for pure medical science. Experiments are being conducted aboard Salyut-7 with use of a number of agents that help normalization of the body, in particular, of calcium metabolism. The experiment with the Argument instrument is important. It is an echograph that helps examine cardiac function. This portable equipment weighs about 1/20th of the weight of a stationary instrument. It is used by emergency brigades. Designers are working on development of a unit that would combine an echograph and electrocardiograph. It could be used in all clinics and be of unquestionable assistance in implementing universal dispensary care.

The Genome experiment, which is being conducted aboard Salyut-7, is of special scientific interest. For the first time, an effort is being made in space to separate large fragments of nucleic acids from one another. Such separation is virtually impossible under terrestrial conditions. We are very hopeful that this problem will be solved in space. Separation of DNA may turn out to be the greatest achievement of medicine.

The scientist noted that the tasks for space medicine are quite extensive and profound. He said that the research of cardiologist Oleg At'kov will furnish science with useful data needed for cosmonautics and for terrestrial medical practice directly.

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SOME PRINCIPLES OF PLANT RESOURCES EVALUATION USING REMOTELY SENSED DATA

Leningrad RASTITEL'NYYE RESURSY in Russian 20 (3) 84.  
(manuscript received 22 Jun 83) pp 297-307

[Article by S. M. Gorozhankina and V. D. Konstantinov, Institute of Forestry and Wood imeni V. N. Sukachev, USSR Academy of Sciences, Krasnoyarsk] [Boldface materials represents italics in original]

[Text] Up to now exploitation of Siberian plant resources has been limited to the basic utilization of wood. However, arboreal forest resources by no means constitute the main wealth of the economic zone's raw materials [Moiseyev, 1980]. Both ligneous and nonligneous plant resources must be actively included in economic activity in order that the taiga territory be exploited totally [Pozdnyakov, 1980, 1982]. In this case, the economic exploitation system should be oriented to the most promising source of raw material.

Rational and complex exploitation of natural resources includes development of a scientifically based method to evaluate and calculate nonligneous forest resources. However, this problem has not been entirely resolved up to now. The data of forest resources inventarization are very scanty with respect to plants of the herbaceous and shrub classes of the plant kingdom. Moreover, inasmuch as lignotypology and geobotanical research fail to consider many indicators of a plant resource that are very important economically, they cannot serve as a solid basis on which to evaluate territory. There is a need for efficient study of the geography and ecology of exploitable nonligneous species, based on the principle that characteristics of their development and dispersal are intimately linked to the structure of the ground cover as biogeocenosis at all organizational levels. The study of dispersal areas and the determination of reserves and the seasonal dynamics of nonligneous plant production ought to take into account the characteristics of soils and the plant cover; in this, stationary observations must be combined with consistent substantiation of data obtained extraterrestrially using remote-sensing photography of territory.

This communication sets forth experience in studying nonligneous vegetative raw materials of significance for nutrition and medicine that occur in forest and swamp biogeocenoses in the southern taiga subzone of Western Siberia up to the Yenisey west bank. The data were obtained by remote sensing.

Information on the territory's resources is evaluated in several stages by analyses of variable-scale aerocosmic video data, on the basis of which schemata are drawn up showing formation of natural regions and maps of soils and geobotany, the scale of which is gradually reduced. At each level a specific system is developed to indicate and assess species of plant raw materials.

The first stage makes use of large-scale (about 1 : 2 million - 1 : 3 million) space photos representing in the most general way the nature of the soil and vegetative cover and, in this connection, the potential of the plant resources found in the territory. The photos reveal the parameters of the total geographical order: zonal classification of the territory, groups of underlying vegetative formations and the zonal type of the soil formation in connection with underlying soil-forming species. At this stage the territory is differentiated according to soil and geobotanical environment [Gorozhankina and Konstantinov, 1983]. On the higher level of the taxonomic classifications of the plant kingdom, we find the most generalized relationships among vegetative raw materials from the point of view of ecology and phytocenosis. The scheme through which the section of the Western Siberian Ravine is broken down into environmental regions according to large-scale space photos is shown in Figure 1.

The succeeding task is more detailed study of the soil and vegetative structure within individual environments, for which space photos on a moderate scale (about 1 : 1 million) are used. Using these the classification of the territory of the environment into regions according to soil and geobotany is carried out as a basis for determining the relationship between soil type and plant life with relief. On this level of classification the territory may be differentiated by elementary geographic zones according to features of nonligneous vegetative resources (Figure 2). An ecological and phytocenosis-descriptive determination of species of economic plants is made on the level of plant-life formations, less often, on that of groups of formations.

The subsequent detailization of the soil structure and that of the plant cover of the regions is based on medium -scale space and high aerial photos (about 1 : 200 000 - 1 : 150 000). Good overviews and a high degree of differentiation in representation make possible total cartographization based on these photos of the region's soil and its plant cover (Figure 3). The maps are used to identify specific territories useful to the study of resources. A chain of ground key-numbers for subsequent reconnaissance and a detailed survey is planned in conformance with the maps; it covers an individual region.

The chief goal of terrestrial investigations is to determine evaluative parameters of concrete raw-material plants of the phytocenoses and disclose a

detailed ecological relationship among them as phytocenoses. Using small-scale (about 1 : 10,000) aerial photos a terrestrial representation of raw materials resources is made. On this level we decipher individual biogeocenoses; in these boundaries the form and dimensions of elementary raw materials zones are determined. The key numbers make it possible to grasp the entire required extent of resource information.

The basic evaluative parameters that we have adopted to characterize raw materials plants are shown in Table 1. Several parameters: (1) species, (2) level of production, and (3) accessibility in harvesting, are determined by terrestrial techniques alone. By way of orientation the numerical ratings reflect the level of processing of raw materials by the population for personal use and the local market and by manufacturing organizations. A score of 3 indicates that mass processing is sufficient to completely meet the needs of the population, the local market, and manufacturing organizations; a score of 2, that the needs of the population and the local market are entirely met but those of manufacturing organizations are met incompletely; a score of 1 indicates that mass processing is carried on but the needs of the local population are met only partially. Using aerial photos the remaining parameters are established: (4) the configuration and dimensions of elementary resource zones, (5) the distribution of these zones and (6) the total area of zones featuring each species of raw material as an entirety for the region.

Production level in and of itself does not serve as an absolute indicator for the entire territory from the point of view of raw materials resources. In many ways this is determined by the nature of distribution of resource zones. For example, industrial processing of raw material is unprofitable if elementary zones are distributed as points or small areas for a single harvest or are sparsely distributed even for a good harvest. A territory may be considered promising from the raw materials point of view only if conditions of the contours formed by elementary zones show massive distribution and stable (or minimally--periodic) availability of moderate and high yields of the raw material.

The detailed relationship of economic plant species from the point of view of ecology and phytocenosis is studied through surveys of the soil and geobotany (Gorozhankina, 1981; Konstantinov, 1981, 1982a) using terrestrial key numbers and observations over many years of soil moisture and microclimate elements (Konstantinov, 1981, 1982b). Overall the basic types of phytocenosis that show promise as raw materials are determined and characterized in detail as their complete census in Table II\* shows.

We shall characterize briefly the relationship of economic species in terms of ecology and phytocenosis in the boundaries of the territory that our observations cover.

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For letter and numerical ratings in Table II, see Table I.

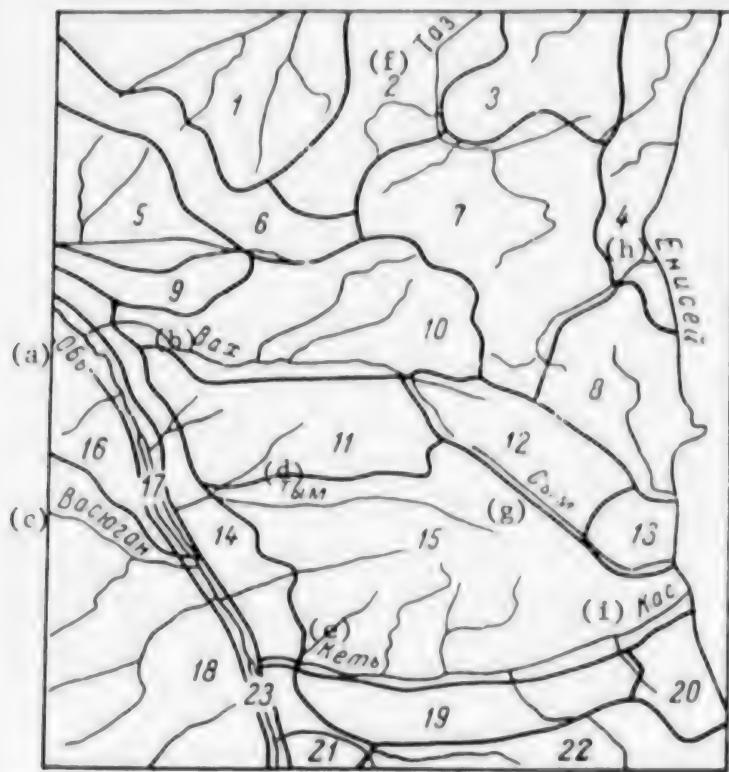


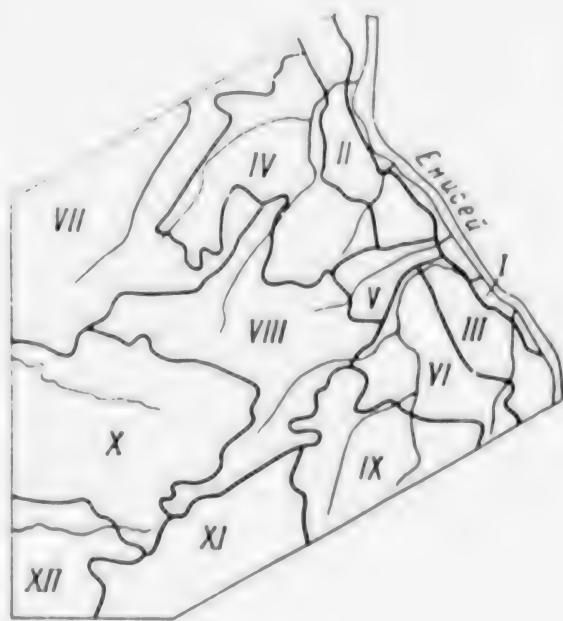
Fig. 1. Outline of division of territory into regions according to soil and geobotany based on large-scale space photos.

- |             |            |
|-------------|------------|
| a. Ob'      | f. Taz     |
| b. Vakh     | g. Sym     |
| c. Vasyugan | h. Yenisey |
| d. Tym      | i. Kas     |
| e. Ket'     |            |

**Soil and geobotanic environment:** 1. Ob'-Taz north taiga pine-deciduous-swamp, 2. Taz north taiga swamp-spruce-deciduous sparse forest, 3. Taz-Yenisey transitional dark coniferous-deciduous, 4. Yenisey littoral swamp-deciduous-dark coniferous, 5. Surgut north taiga pine-swamp, 6. Siberia-Yval' north taiga deciduous-swamp-pine, 7. Yelogui transitional deciduous-pine-dark coniferous, 8. Dubchesk middle taiga spruce cedar, 9. Agan middle taiga pine-spruce-cedar, 10. Vakh left littoral middle taiga pine-cedar-swamp, 11. Vakh Tym middle taiga 12. Upper Sym middle taiga pine-spruce-cedar, 13. Lower Sym middle taiga pine-swamp, 14. Ob' right littoral middle taiga pine-swamp, 15. Ket'-Tym middle taiga ravine forest swamp, 16. Ob' left littoral middle taiga swamp-pine-cedar, 17. Ob' floodplain middle taiga willow-meadow, 18. Ob' Irtysh south taiga swamp-dark coniferous, 19. Ket'-Ulu-Yul' transitional pine-fir-cedar, 20. Great Kas south taiga dark coniferous, 21. Ob' Chulyum south taiga swamp-pine, 22. Chulyum-Yenisey south taiga small-leaved-fir, 23. Ob' floodplain south taiga popular-meadow.

**Fig. 2. Analysis of territory using small-scale space photos by soil/geobotanical regions (approx. 20)**

**Soil/geobotanical regions:** I. Complexes of basement and sub-basement dark coniferous mossy-herbaceous forest and low swamp of Pleistocene loamy flat floodplain terrace; II, III. Complexes of basement and sub-basement spruce-cedar herbaceous-mossy and transitional swamp of Pleistocene flat floodplain terrace; IV, VI. Complexes of dark coniferous herbaceous-mossy forests of divided loamy pre-Pleistocene terrace of transit rivers; V, VII. Dark coniferous-pine-swamp complexes of superimposed sand terrace; VII, IX. Complexes of basement spruce-cedar herbaceous-mossy and secondary small-leaved herbaceous forests of loamy subsoil surfaces; X, XI, XII. Complexes of simple and mixed pine forests with shallow-massed cedars and secondary small-leaved shrub-mossy forests of former lacrustial-alluvial terraces.



**TABLE I**  
**Evaluative Parameters of Studied Economic Plant Species**

Parameters	Indicator of Value
1. Raw material species	+ - Fruits 0 - Above-ground vegetative organs
2. Production level	High (score of 3) Medium (score of 2) Low (score of 1) No economic importance (score of 0)
3. Accessibility of harvest (No. of harvest seasons per decade, %)	C (=S) - stable (at least 70%) (=P) - periodic (about 50%) (=E) - episodic (not more than 20-30%)
4. Configuration and dimensions of elementary resource zones (by lines in meters)	Large-contour (100s of meters) Small-contour (10s of meters) Punctate (isolated specimens of plant raw materials)
5. Distribution of elementary resource zones	Massive Scattered Isolated
6. Total area of resource zones by species of economic plant.	% of area of region

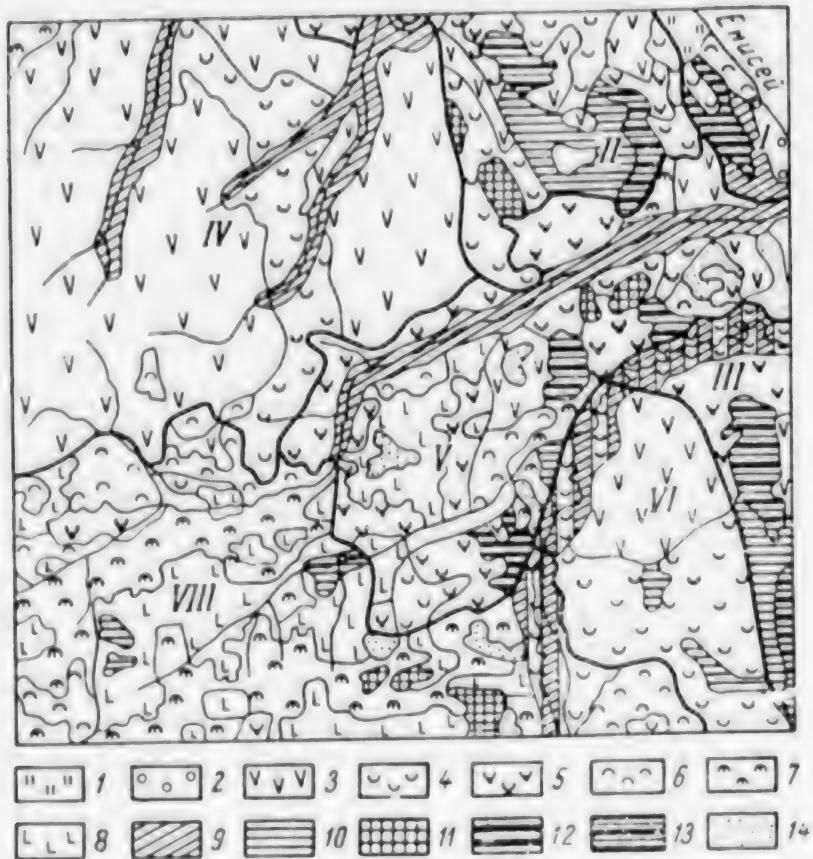


Fig. 3. Cartography of Plant Life Based on Small-Scale Space Photos

I-VIII. Soil/Geobotanical regions as in Fig. 2. Vegetative cover:

1. Meadow varied herbaceous-gramineous,
2. Shrub low-floodplain herbaceous,
3. Taiga fir-spruce herbaceous and complex with derivative small-leaved-spruce-cedar-green moss,
5. Cedar with pine herbaceous-shrub-green moss,
6. Pine mixed asp-dark coniferous shrub-green moss,
8. pine clearing,
9. taiga, small-leaved spruce-sphagnum-herbaceous,
10. taiga spruce-small-leaved-cedar herbaceous sphagnum,
11. pine shrub-sphagnum,
12. swamp herbaceous Hypnum lowland,
13. swamp, herbaceous sphagnum transitional,
14. swamp pine-sphagnum heights.

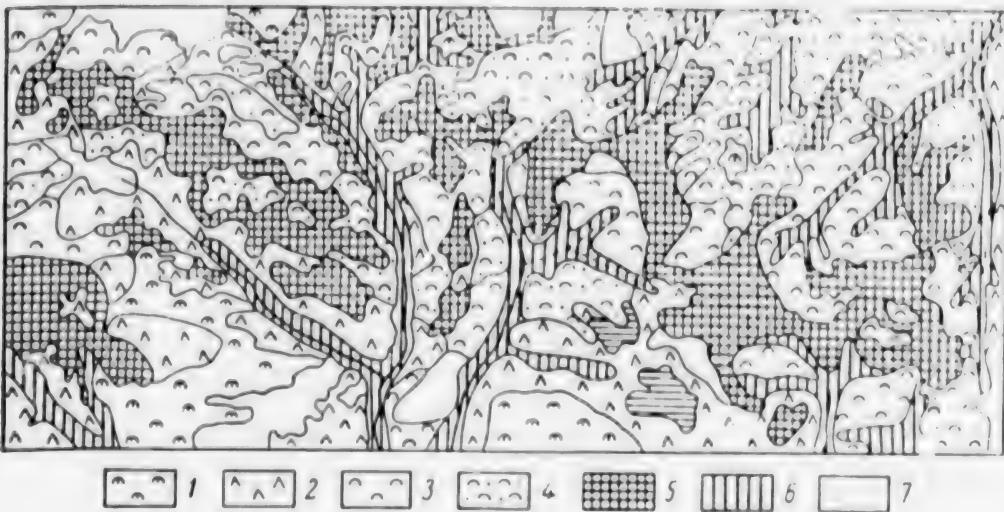


Fig. 4. Detailed cartographization of economic sector using moderate-scale aerial photos (Soil/geobotanical Region X used as example).

Phytocenoses with economic resources in the form of berry- and fruit-yielding plants: 1. Pine forest, simple deciduous in a complex with green mossy-deciduous (processing of ptarmiganberry ARCTOSTAPHYLOS UVA-URSI (L.) Spreng. and crowberry EMPETRUM NIGRUM L.), 2. Pine forest, simple whortleberry-green moss (processing of whortleberry VACCINIUM VITIS-IDAEA L.), 3. Pine forest mixed berry-green moss complex with bilberry-green moss, 4. cedar bilberry-green moss in complex with mixed pine forest bilberry-green moss (processing of bilberry VACCINIUM MYRTILLUS L.), 5. Pine bilberry-sphagnum in complex with herbaceous-shrub-sphagnum (processing of whortleberry VACCINIUM VITIS-IDAEA and bilberry VACCINIUM MYRTILLUS L. and great bilberry VACCINIUM ULIGINOSUM L.), 6. Cedar bilberry-sphagnum in complex with pine bilberry sphagnum (processing of bilberry VACCINIUM MYRTILLUS L.), 7. Phytocenoses without economic importance.

The ptarmiganberry ARCTOSTAPHYLOS UVA-URSI (L.) Spreng. and crowberry EMPETRUM NIGRUM L.\* Associated in its distribution with simple poor pine forests on sandy podzols. Ptarmiganberry occupies the driest isolated ecotypes occurring in areas of lichenous pines thinned by fires and sparse pine saplings of pyrogenic origin. The crowberry grows under conditions that are similar from the point of view of ecology and microclimate but are more moist: green-lichenous

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The crowberry has been included in this investigation on the basis of its use in popular medicine [Vereshchagin and assoc., 1959]. In academic medicine, this species is not recognized, nor is it used as a food plant.

TABLE II

Representation of Harvest of Economic Plants According to Phytocenosis Types

Feature of Harvest (Letter index) and Production Level (numerical)

## Phytocenosis

	<i>Ribes uva-ursi</i> (L.) Spreng.	<i>Eripe'rum</i> <i>nigrum</i> (L.)	<i>Vaccinium</i> <i>vitis-idaea</i> L.	<i>V. myrtillus</i> L.	<i>V. uliginosum</i> L.	<i>Oxycoccus</i> <i>quadripetalus</i> Gilib.	<i>Rubus</i> <i>chamaemorus</i> L.
	0	+	0	+	0	+	+
Decid. & green-moss decid. pine.	1	S, 1-2	1-2	P, 1-2	1		
Simple whortleberry green-moss pine.	S, 0	0	S, 2-3	3			
Mixed berry green-moss pine.			P, 2-3	2	P, 1-2	2	
Mixed bilberry green-moss pine.			P, 1	1	P, 2-3	3	E, 1
Bilberry green-moss cedar.				P, 1-2	3		
Bilberry sphagnum cedar.				S, 2-3	1		
Bilberry sphagnum pine.				S, 2-3	2	P, 1	
Herbaceous shrub sphagnum pine.					P, 2-3		
Pine oligotrophic shrub sphagnum swamp.						E, 1	E, 1-2
Pine mesotrophic cranberry sphagnum swamp.						P, 1-2	
Stratum mesotrophic cranberry sphagnum swamp.						S, 2-3	
Stratum mesotrophic Vakh cranberry sphagnum.						S, 2-3	
Stratum eutrophic herbaceous Hypsum swamp.						P, 2-3	

Feature of Harvest (Letter index) and Production Level (numerical)

## Phytocenosis

	<i>Ribes nigrum</i> L.	<i>Padus racemea-</i> <i>noides</i> (Lam.) Gilib.		<i>Sorbus sibirica</i> Hedl.	<i>Rosa acieca-</i> <i>rora</i> Lindl.	<i>Acer campestre-</i> <i>serratum</i> L.	
	+	+		+	+	+	+
Littoral herb.			Ced. fir herb. gr-m spruce	E, 0	P, 0	E, 0	
shrub spruce.	P, 2-3		Dark conif. decid wood	P, 0	P, 0	P, 0	
Choke cherry willow.	P, 1-2	P, 1-2	herbaceous mixed herbs reed grass				

Table III  
Soil/Geobotanical Evaluation of Regions According to Reserves of Economic Plants

Region No.	Species	Total Zonal Area (ha)	Dimensions & Distribution of Elementary Zones	Utilization of Plant Resources	
				Harvest Ac-	Prod.lev., Score
I	OXYCOCCUS QUADRIPETALUS Giliib.	23	Small-contour scattered	S	2-3 Processing of O. QUADRIPETALUS fruits (from low floodplain terrace swamps), R. NIGRUM and P. RACEMOSA (in choke cherry & willow forest)
	PADUS RACEMOSA (Lam.) Giliib.	10	Large-contour scattered	P	1-2
	RIBES NIGRUM	10	Likewise	P	1-2
	CRATAEGUS SANGUINEA Pall.	26.8	Punctate	P	0
	ROSA ACICULARIS Lindl.	27.2	"	P	0
	ROSA CINNAMOMEA L.				
	SORBUS SIBIRICA Hedl.	27.2	"	P	0
	VACCINIUM VITIS-IDAEA L.	2.4	Large-contour isolated	S	2-3
	V. MYRTILLUS L.	1.8	Likewise	S	2-3
	OXYCOCCUS QUADRIPETALUS Giliib.	16.5	Small-contour scattered	S	2-3 Processing of V. MYRILLUS fruits and leaves (in green-moss and sphagnum cedar forest),
	VACCINIUM MYRTILLUS L.	32.5	Small-contour massive	S	2-3 O. QUADRIPETALUS (on transitional swamps)
II, III	CRATAEGUS SANGUINEA Pall.	18.0	Punctate		

TABLE III (Continued)  
Soil/Geobotanical Evaluation of Regions According to Reserves of Economic Plants

Region Species No.	Total Zonal Area (%)	Dimensions and Distribu- tion of Elementary Zones	Utilization of Plant Resources (see preceding page)
II, III SORBUS SIBIRICA	54.5	Punctate	P 0
Hedl.			el., Score Productivity level, Lev-
ROSA ACICULARIS	59.9	"	P 0
Lindl., ROSA CINNAMOMEA L.			Harvest Ac- cessibility
IV, VI SORBUS SIBIRICA	91.9	"	P 0
Hedl.			Region without potential for economic development
ROSA ACICULARIS	91.9	"	P 0
Lindl., ROSA CINNAMOMEA L.			
CRATAEGUS SAN- GUINEA Pall.	72.4	"	P 0
VACCINIUM MYR- TILLUS L.	3.6	Small-contour iso- lated	P 1-2
OXYCOCCUS QUADRI- PETALUS Gilib.	0.2	Large-contour iso- lated	P 2-3
VACCINIUM VITIS-IDAEA L.		Small-contour iso- lated	P 1-2

TABLE III (Concluded)  
Soil/Geobotanical Evaluation of Regions According to Reserves of Economic Plants

Region No.	Species	Total Zonal Area (%)	Dimensions and Distr- ibution of Elementary Zones	Utilization of Plant Resources	
				Harvest Ac- cessibility	El., Score Production Lev-
V	VACCINUM MYRTILLUS L.	30.1	Small-contour massive	S	2-3
	V. VITIS-IDAEA L.	16.4	Large-contour scattered	S	2-3
	OXYCOCCUS QUADRIPETALUS Gilib.	18.8	Small-contour scattered	S	2-3
	ROSA ACICULARIS Lindl.,	28.5	Punctate	P	0
	ROSA CINNAMOMEA L.	28.5	"	P	0
	SORBUS SIBIRICA Hedl.	12.8	"	P	0
	CRATAEGUS SANGUINEA Pall.				
	RUBUS CHAMAEMORUS L.	7.5	Large-contour isolated	E	1-2
VIII	VACCINUM VITIS-IDAEA L.	65.8	Small-contour massive	S	2-3
	EMPETRUM NIGRUM L.	21.1	Likewise	S	1-2
	A. UVA-URSI (L.) Spreng.	21.1	contour scattered	S	1
	VACCINUM MYRTILLUS ".	36.6	Small-contour scattered	P	2-3
	O. QUADRIPETALUS Gilib.	4.7	Large-contour isolated	E	1
	VACCINUM ULIGINOSUM L.	3.6	Likewise	P	2-3
	RUBUS CHAMAEMORUS L.	6.8	"	E	1-2
	R. ACICULARIS Lindl.,	4.3	Punctate	P	0
	R. CINNAMOMEA L.				
	SORBUS SIBIRICA Hedl.	4.3	"	E	0

pine forests of pyrogenic origin. For this reason its ecological range is broader. Depending on the density of the wood cover of pines, the abundance of both species decreases in the course of successive regrowth and, as a result, there is a decreasing processing potential of their fruits and leaves.

The whortleberry *VACCINIUM VITIS-IDAEA* L. Its distribution is associated with moderately drained simple pine forests belonging to podzolic soils of coarse and medium-grained sandy composition. The greatest harvests of terrestrial vegetative organs and fruits occur in moderately dense cowberry-green moss pine forest types with optimal light and microclimatic conditions. It also occurs in green moss-lichenous pine forests cleared by fire (density of forest canopy about 0.3); however, the annual accessibility of the berry harvest is sharply reduced by spring thaws and excessive isolation during ripening. Large supplies of leaves and fairly good stable harvests of berries have been found in mixed pine forest with green moss where choke cherry and whortleberry grow together, formed on podzolic soils of tenacious-sandy and laminal sandy soil. In these forest types the whortle berry surpasses the choke cherry in productivity.

The bilberry *VACCINIUM MYRTILLUS* L. Among other swamp berries and shrubs it is distinguished by the broad ecological spread of phytocenoses, growing in mixed dry-valley areas and swamp pine forests on sandy soils, dry valleys, swamp cedar forests and heavy-clay and clay soils. Topographic position greatly influences the productivity of the bilberry. In particular, yield and accessibility are greater close to fluvial terraces of low hypsometric level than high terraces and watersheds with a less favorable microclimate (where soil frosts are more frequently repeated in the blossoming period). There are moderate and large periodic harvests of fruits of this species in the bilberry-green moss and berry-mixed pine forests. A high ground-water level undermines the activity of soil frosts in the flowering period. In dry valleys bilberry-green moss-cedar forests feature bilberries in large supply as leaf phytomass, but the fruits are not readily accessible to harvest.

The great bilberry *VACCINIUM ULIGINOSUM* L. Related in its distribution to simple and mixed moist and swampy pine forests formed on sandy terraces of alluvial and lacrustian-alluvial origin and on river floodplains nourished by poor and acid waters. On the whole, this species does yield abundant berries. The largest, most accessible harvest of fruits of the great bilberry are found in swampy herbaceous-shrub-sphagnum pine forests on lightly laminated transitional and mixed peat bog.

The cranberry *OXYCOCCUS QUADRIPETALUS* Gilib. Resources of the fruits, which have industrial significance, are associated with open (less often, forest) swamps of low and transitional types. The mesotrophic Osok cranberry sphagnum and Vakh cranberry sphagnum in shallow-stratum swamp have the greatest economic value; its conditions are extremely favorable for harvesting berries of the cranberry-sphagnum association where other species do not occur.

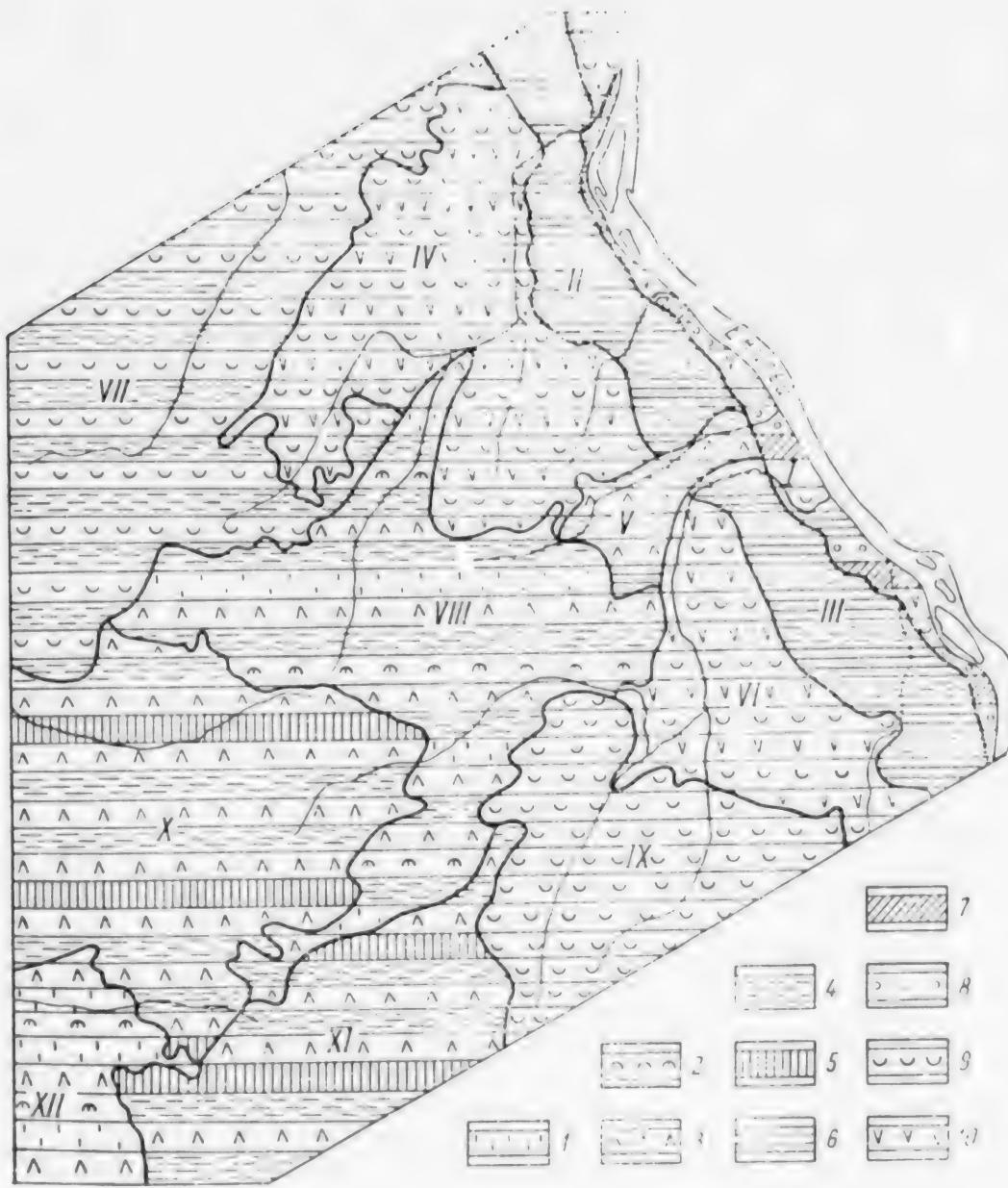


Fig. 5. Plan of Detailed Division into Regions  
by Resources

Distribution of berry species: 1. *ARCTOSTAPHYLOS UVA-URSI* (L.) Spreng.,  
2. *EMPETRUM NIGRUM* L., 3. *VACCINUM VITIS-IDAEA* L., 4. *VACCINUM MYRTILLUS* L.,  
5. *VACCINUM ULIGINOSUM* L., 6. *OXYCOCCUS QUADRIPETALUS* Gilib., 7. *RIBES NIGRUM*  
L., 8. *PADUS RACEMOSA* (Lam.) Gilib., 9. *SORBUS SIBIRICA* Hedl., *ROSA ACICU-*  
*LARIS* Lindl., *ROSA CINNAMOMEA* L., 10. *CRATAEGUS SANGUINEA* Pall.

Fig. 5 caption continued: Fruit-processing regions: I. Cranberry O. QUADRIPE-TALUS (lowland floodplain terrace swamp), black currant R. NIGRUM and choke cherry P. RACEMOSA (choke cherry-willow); II, III. Bilberry V. MYRTILLUS (green moss/sphagnum cedar), O. QUADRIPETALUS (transitional swamp) V. V. MYRTILLUS (Green-moss/sphagnum cedar forest), whortleberry V. VITIS-IDAEA (green-moss simple pine woods), O. QUADRIPETALUS (heterotrophic floodplain terrace swamp); VII. V. MYRTILLUS (green-moss/sphagnum cedar forest); VIII. V. VITIS-IDAEA (green-moss simple and mixed pine forests), V. MYRTILLUS (green-moss mixed pine forest, sphagnum pine and cedar forests), ptarmiganberry A. UVA-URSI and crowberry E. NIGRUM (deciduous pine forest); X. V. VITIS-IDAEA (green moss simple and mixed forest), V. MYRTILLUS (mixed green-moss pine, sphagnum pine and cedar), great bilberry V. ULIGINOSUM (sphagnum pine); XII. V. VITIS-IDAEA (green moss simple and mixed pine forests), A. UVA-URSI and crowberry C. NIGRUM (deciduous pine forests); IV, VI, IX—No economic potential.

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The cloudberry RUBUS CHAMAEMORUS L. Not an economic resource of the studied territory on the whole; associated with oligotrophic pine swamps. Low accessibility of harvest probably owing to high summer temperature and relatively dry air that cause significant fall of ripened fruits.

The black currant RIBES NIGRUM L. While not occupying significant area, occurs as isolated scrub on floodplain of shallow rivers and streams, loamy watersheds and dry river beds and silted oxbows of the Yenisey and other major rivers. In floodplains nourished by poor acid waters, production of species sharply reduced. The ecotopes with a nearly neutral reaction of soil waters are best distributed. This species is associated with river-bed wet herbaceous shrub spruce forest, where fruit-bearing shrubs cluster directly on the littoral edge of the channel. Some abundant years; generally unstable.

The prickly rose ROSA ACICULARIS Lindl. and R. CINNAMOMEA L., the rowan SORBUS SIBIRICA Hedl., and the hawthorn CRATAEGUS SANGUINEA Pall. Prickly rose and rowan are widely distributed on loamy watersheds in herbaceous-green moss dark coniferous taiga and derivative small-leaved herbaceous types of forest, occurring in isolated dispersed specimens in forest glades. Periodic small yield. All species including hawthorn found on high floodplain terraces of major rivers. Associated with natural borders and outskirts of hayfields; despite periodic abundance, generally low, poor (fungus-infected) berry yield.

The choke cherry PADUS RACEMOSA (Lam.) Gilib. Its distribution is limited to low terraces of the Yenisey and the major tributaries thereof, where it forms scrub along with various willow species and those of other shrubs. The choke cherry yield is periodic but, all in all, low.

At the end of the terrestrial key observation using moderate scale (about 1 : 50,000) aerial photos, a detailed resource cartography is produced for the territory's regions in terms of soil and geobotany showing phytocenoses with significance as resources (Fig. 4). An indication of economic plants is made on the level of lower taxonomic plant life. The map shows specific segments of processing, in connection with which questions of transportation of pickers to the site are settled, as are those of removal of the harvested raw material; the necessary calculations are made for the areas of zones, assumed yields of processing and other parameters.

The final stage of investigations is a detailed evaluation of the territory by means of resource regions. For these purposes, an assessment table suitable to each soil and geobotanical region is drawn up. In the table a general accounting of berry and fruit-plant species is made with the evaluative parameters for the species (Table 3). The analysis corresponding to the assessment table makes it possible to arrive at the significance of each soil and geobotanical region for processing of raw material. Overall, on the basis of the plan of division into regions a plan is drawn up in detail for resource computation of the territory in terms of regions. The plan of resource regions (Fig. 5) serves along with plans of forest management as a basic document in working out optimal versions for rational use of natural resources and smooth organization of forestry.

**CONCLUSION.** Use of aerial and space photos has great significance for resource cartography and division into regions. The disclosure of territory that is suitable for resource exploitation and the assessment of resource species as to quality and quantity is done in stages. The division of territory on the level of cenoses, carried out on the basis of large-scale space photos, allows us to determine the resource parameters of a geographical nature. Moderate and small-scale space photos give detailed differentiation of regions on the level of soil and geobotanical regions, as a result of which those territories promising for resource content are revealed. Middle and small-scale aerial photos are used for resource cartography of phytocenoses, with which the distribution of valuable raw materials plant is connected. On the basis of the maps detailed resource assessment of the territory being studied is made and practical questions related to raw materials processing are decided.

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## EFFECTIVENESS OF AGRICULTURAL AVIATION

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 pp 2-4

[Article by V. V. Kuz'kin, first deputy director of the Administration of Civil Aviation in the Central Region: "Raising the Effectiveness of Agricultural Aviation"]

[Text] At the February 1984 Plenum of the CPSU Central Committee the General Secretary of the CPSU Central Committee, Comrade K. U. Chernenko, emphasized that intensification, the accelerated introduction of scientific achievements and technology into production and the implementation of comprehensive programs are the basic directions for developing our economy. The implementation of the Food Program is the business of all branches of the national economy and of all the people. A large contribution to its fulfillment belongs to agricultural aviation.

In 3 years of the five-year plan aviation-chemical work was completed on an area of about 310 million hectares. Aviators have given grain farmers of the RSFSR, the Ukraine, Kazakhstan and Belorussia a great deal of help; they carried out cotton defoliation operations in Uzbekistan and other cotton-sowing republics in a compressed period of time and with high quality.

A growth in the volume of aviation-chemical work is accompanied by an improvement in qualitative indicators--an improvement in the productivity of flights, economizing on material expenditures and the introduction of new technological methods and agricultural apparatuses (Figure 1). Flight organization is being improved and ties between aviation enterprises and soviets of agroindustrial associations, Sel'khozkhimiya [Agricultural Chemical Association] associations, kolkhozes and sovkhozes are being strengthened. More progressive methods (rotational, combination of several plots for treatment during one flight, work by shift or sub-shift crews, flights with deflected flaps) and highly productive apparatuses (RTSh-1, TsBR) are being more widely employed.

The most important indicator of effectiveness of agricultural aviation is the productivity of flights, which is directly related to the maximally-tolerated load of chemicals on the flying apparatus and indirectly related to the expenditure norm per hectare and to the duration of the flight. Since the capacity of the bunker in the plane is constant and the norm for expenditure

of chemicals is established by agronomists according to the type of work that is being done, great significance in increasing productivity is attached to decreasing flight time by curtailing the hop from the agricultural airport to the plot being treated (Figure 2). The productivity of planes and helicopters is also affected by the configuration of fields, the agricultural equipment used, technical methods, the time chemicals are loaded and so forth.

Cost price also belongs to the basic indicators of production effectiveness. In 1983 it increased by 10 percent as compared to 1981, whereas at the same time the volume of aviation chemical operations increased by only 6 percent and tariffs remained practically unchanged. The expenditures of aviation enterprises increase each year and from this stems the task of constantly controlling the decrease in expenditures.

An improvement in the operations of agricultural aviation is facilitated by the strengthening of its material-technical base and by improving labor organization. At the present time in kolkhozes and sovkhozes there are 1,770 agricultural airports with paved runways in operation, which is 330 more than were available in 1980. Their building is being carried out well in the Ukraine, Uzbekistan, Lithuania and Belorussia. Little attention is given to this question in some oblasts of the RSFSR, Moldavia and Latvia.

The effectiveness of utilizing airplanes and helicopters increases with the organization of support bases. In 1983 about 300 such bases were created in regions that intensively utilized aviation. In the future this problem must be dealt with jointly by agricultural organs and aviation enterprises. For example, aviation is a big help in Sovkhoz imeni Krupskaya of Ulyanovsk Oblast, which has a support base. The sovkhoz has 30,800 hectares of arable land. A specialized productivity detachment has been created here and the following have been built: a storehouse for mineral fertilizers with a capacity of 4,000 tons of friable and 600 tons of liquid complex fertilizers, a storehouse for pesticides with a capacity of 200 tons, a paved air strip, a parking site for two An-2 airplanes and a rest house for summer crews and sovkhoz workers who service agricultural aviation. There are resources for mechanizing work in the storehouses and for loading planes. The volume of aviation operations in the enterprise has increased from 40,000 hectares in 1980 to 72,000 hectares in 1983; last year the productivity of grains equalled 30 quintals per hectare. The cost of the air strip (202,000 rubles) was repaid in 3 years thanks to the increase in the productivity of grains of 1.5-2.5 quintals per hectare, which was achieved as a result of top-dressing from planes on frozen soil.

One of the most important advantages of agricultural aviation is its high degree of maneuverability. Last year by means of maneuvering about 19 million hectares were treated in a compressed period of time. Figure 3 shows the volume of work completed by an attached fleet of planes in a number of regions.

At the same time, maneuverability is tied to additional expenditures; this is why it must be constructed on the basis of precise business-like interrelations with agricultural organs and why it must be strictly planned. A careful preparation for the reception of additional quantities of planes is essential in the enterprise. Unfortunately, this is not done everywhere.

Figure 1. Volume of aviation-chemical operations (actual and planned) carried out by small capacity sprayers (1), RTSh-1 dusters (2), An-2 planes with a 5 degree flap deflection (3), and total (4).

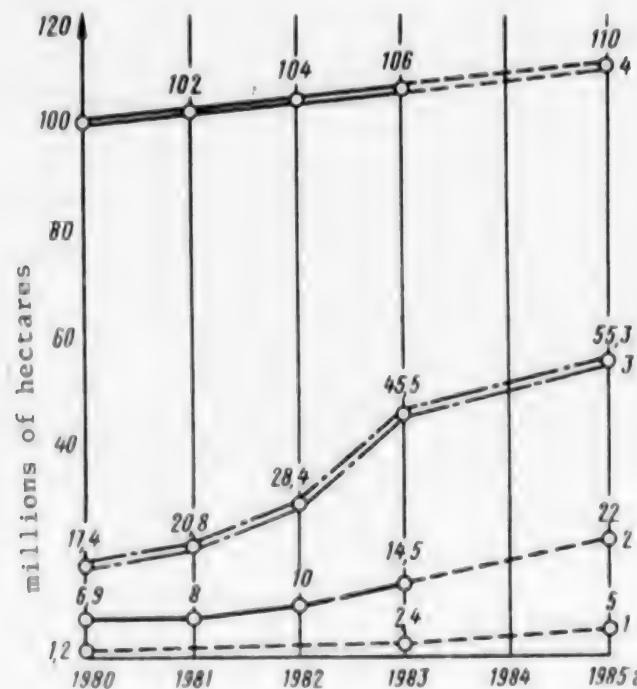


Figure 2. Dependence of the productivity of An-2 airplanes (1) on the norm for expenditure of chemicals (2) and on flight distance (3).

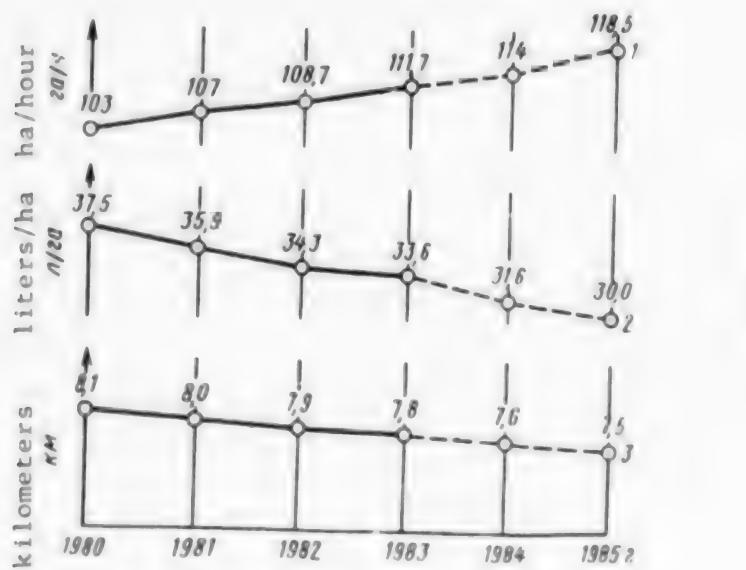
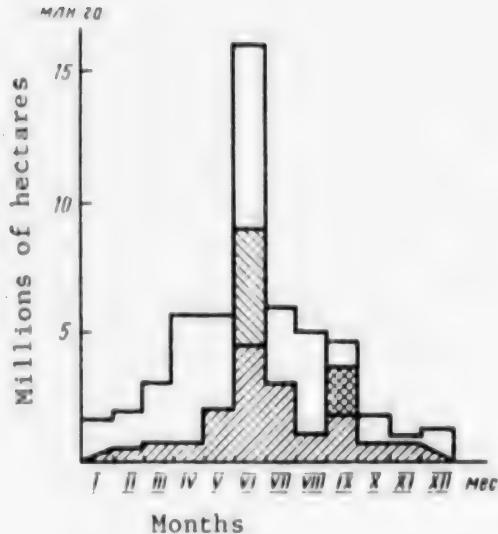


Figure 3. Volume of Aviation-Chemical Work Performed in 1983



Key:

- --Performed by means of aviation enterprises themselves.
- ▨ --Performed by attached fleet of airplanes in the Northern Caucasus,
- ▨ --in Kazakhstan and in Uzbekistan respectively.

In Uzbekistan, for example, too many airplanes are called out each year to defoliate cotton, and they remain idle waiting for work. In 1983 alone idleness equalled over 2,800 plane-days. Similar examples can be cited in Kazakhstan, the Northern Caucasus and the Transvolga region.

The maneuvering of the airborne fleet will continue, but it is essential to more fully utilize the reserves belonging to aviation enterprises themselves, to improve the productivity of every airplane and helicopter and to curtail idleness in airborne vessels for various reasons. Frequently idleness occurs as a result of the absence of chemicals or loading means or because of the lack of preparation of signal men and brigades for loading planes, and so forth. Associations of Sel'khozkhimiya, enterprises and aviation enterprises must take measures to improve the organization of operations at airports, the building of airport complexes and the supply of a system of machines for preparing and loading chemicals into planes and helicopters. Incidentally, many enterprises and associations of Sel'khozkhimiya in Lithuania and Moscow Oblast carry out loading operations using their own forces.

Agreements with enterprises should reflect joint responsibility for the development of socialist competition, for achieving high productivity and a

high degree of flight safety, and for curtailing the idleness of airplanes and helicopters. Flight safety depends on the quality of preparations for flights, the professional skill of pilots and on the discipline and organization and work and personal conditions available for flight crews.

An improvement in the effectiveness of airplanes and helicopters depends to a large extent on the dependability on agricultural equipment, on the means for controlling the quality of aviation-chemical work and on accelerating the development of new test specimens using polymers.

The interest of the situation requires an expansion of rights for enterprises and associations with regard to planning and economic activities, an increase in their responsibility for end results and the creation of conditions that will facilitate the development of creative initiative in workers. In accordance with tasks put forth at the All-Union Economic Conference on Problems of the Agro-Industrial Complex, special attention is being given to improving planning and management in all links of the APK [Agro-Industrial Complex]. The first steps in this direction have been taken. For example, in the Belorussian Administration of Civil Aviation an economic experiment has been initiated--acreage treated and flight productivity have replaced flight time as basic indicators for fulfilling aviation-chemical work.

The administration successfully fulfilled its plan for treating acreage. Checks were made of production norms of flights, the use of the agricultural airport network and the system for paying wages and for materially stimulating flight and technical crews.

This year the Lithuanian and Turkmen administrations of civil aviation and two aviation enterprises each in the administrations of the Northern Caucasus, the Ukraine, the central regions and the Transvolga have made the transition to new planning conditions. The expansion of the experiment will enable us to more precisely determine the special features of management, planning, wage payments and economic stimulation, and of AKhR [Aviation-chemical work] norms, including tariffs, per treated hectare and by 1985 to prepare a well-adjusted economic mechanism for the operation of agricultural aviation.

Great tasks stand before planning and economic services and production organizers. First and foremost it is necessary to work out norms for flight productivity depending on the type of AKhR, the norms for expenditure of chemicals, flight distance and the length of the run on plots being treated with a consideration of local conditions. This will require more precision in work volume for each enterprise, rayon and oblast and a local examination of plans for land use with a consideration of the configuration of fields being treated. All agricultural airports should be utilized better, including those with IVPP [Artificial landing-takeoff strips] as well as ground, including temporary, strips.

It has been established that flight productivity is not the same in different regions of the country. Thus, in 1983 with the use of An-2 planes to spray crops against pests and diseases it equalled 41.8 hectares per hour in Latvia, with an average norm for expenditure of chemicals of 55.3 liters per hectare

and a flight distance of 16 kilometers. In the Northern Caucasus the corresponding figures were 58.5 hectares per hour, 88.4 liters per hectare and 7.8 kilometers, and in the central regions--66.3 hectares per hour, 64.6 liters per hectare and 10 kilometers. This example shows that the curtailment of the flight distance from the agricultural airport to the area being treated is an important economic factor. But at the present time only aviation enterprises are interested in this. It would be expedient to introduce an order that would stimulate the interest of enterprises as well. For example, it would be possible to establish higher tariffs for hops of over 10 kilometers and lower tariffs for those under 10 kilometers.

The resolution of the CPSU Central Committee and USSR Council of Ministers, "On Improving Economic Interrelations Between Agriculture and Other Areas of the National Economy," is oriented toward increasing the responsibility of organizations and enterprises that service agriculture, toward increasing production output and toward strengthening the interests of partners in raising the effectiveness of agriculture. Scientists and specialists of the agro-industrial complex must introduce indicators that will test work by means of the end results of agricultural production--the harvest. Evidently, final accounts of the fulfillment of aviation-chemical work must also be made with a consideration of the productivity of agricultural crops.

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## OPERATION OF AVIATION SUPPORT BASES

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p 4

[Article by E. Kh. Gasanov, commander of an aviation link: "Via Support Bases"]

[Text] In the Zabratetskoye Aviation Enterprise of the Azerbaijan UGA [Administration of Civil Aviation] for the first time in the history of civil aviation a progressive method of group basing of crews has been introduced, enabling us to significantly improve the effectiveness and quality of aviation-chemical operations [AKhR]. In connection with this, the USSR Ministry of Civil Aviation has established a school of progressive experience here. Whereas in 1965 crews from aviation enterprises treated 906,000 hectares, in 1983 the figure was over 1.5 million hectares. Moreover, the fleet of airplanes increased insignificantly, so that this increase was based primarily on an increase in labor productivity.

In the region serviced by the enterprise nine support bases were created. The distance between any one of them and the farthest sowing area was not more than 10-16 kilometers. Each base has an airport, a parking site for air vessels, the means of providing emergency electrical energy, storehouses, production and housing facilities and a dispatcher's point with the necessary means of communication.

The organization of flights is preceded by serious preparations. A staff is created well ahead of time and includes representatives of aviation enterprises and agricultural organs, duties are distributed among services to supply flights from support bases, and plans for the preparation and carrying out of AKhR are composed. Prior to the start of operations the condition of runways is examined. Support bases are supplied with all that is necessary for normal flights--fuel, spare parts, agricultural equipment and so forth. A schedule of controls and checks is developed and strictly adhered to, and the results are discussed. AKhR technology is studied in bases. Serious attention is given to filling brigades of signal men and airplane-loading brigades.

Group bases have provided the opportunity to more precisely organize the fulfillment of contractual agreements, to effectively utilize every airplane and to carry out operational check work in the support base. The active management of flights has enabled us to efficiently maneuver the fleet of

planes, to send planes to those enterprises where, for example, cotton requires immediate defoliation, or to replace a plane in disrepair with another. Dozens of trucks which previously traveled between the fuel base and the airports of kolkhozes and sovkhozes have been freed.

In support bases conditions have been created not only for resting well and for cultural pursuits for crews during their spare time but also for political-educational work and study. Each support base has a cafeteria, library, television sets and radios. To prepare crews for fulfilling AKhR stands with the essential schemes and other visual aids have been set up in special rooms.

This year the collective of aviation enterprises has taken on the obligation of fulfilling the production plan ahead of schedule by the 67th anniversary of October, of increasing labor productivity by 1 percent over the plan, of decreasing the cost price of a flight hour by 0.5 percent and of achieving a savings of 1 percent in GSM [fuel and lubricants].

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## NEW SYSTEM FOR PLANNING, WAGE PAYMENTS REVIEWED

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 pp 5-6

[Article by V. M. Kurilo, director of the Belorussian Administration of Civil Aviation: "A New System for Planning and Reimbursing Labor"]

[Text] The effectiveness of utilizing agricultural aviation is directly related to improving the system of planning aviation-chemical operations [AKhR] and to material stimulation. The Belorussian administration has been working for 3 years now according to this new system, the chief characteristic of which is the evaluation of AKhR according to the number of physical hectares of treated area instead of the number of flight hours. Correspondingly, there has been a change in the economic content of the majority of other indicators--cost price, income, production volume and so forth. The physical hectare has enabled us to tie in production volume with the effectiveness of production activities in aviation enterprises.

The system of wage payments that existed earlier gave an advantage to crews of airplanes and helicopters that worked at a lesser productivity because in this situation the rates per hectare of treated area increased and wages increased as a whole. Aviation workers were not interested in the introduction of new technology. Serious shortcomings existed in the organization of awards of bonuses (no consideration was made of the intensity of plan tasks and of the volume of treated area, there was an absence of controls over the foundation for the planned productivity of flights).

In connection with this we developed proposals on improving wage payments and the awarding of bonuses to crews for aviation-chemical operations. Stable rates were introduced for payments per hectare of treated area, which were calculated by dividing hourly rates by the normative productivity of flights, which was worked out (according to research data of VNIPANKh GA [Expansion unknown] and the administration) for every type of airplane, helicopter, treatment method and expenditure norm of chemicals. With such a system, wages for the flight crew depend first and foremost on the number of hectares treated. The size of bonuses is directly related to the productivity of flights and the size of the area that is treated. The special features of the new system of planning and wage payments to crews are treated in greater detail in the methodological elaborations sent to all administrations and

institutes of civil aviation and in the article, "Not Hours, But Hectares" (GRAZHDANSKAYA AVIATSIYA No 1, 1984).

However, we were not able to introduce the new system immediately. An indicator of long standing, the "time factor" pleases flight and technical personnel and aviation enterprises as a whole, but has a negative effect on the national economic effectiveness of aviation operations and gives the impression of a supposed growth in effectiveness with a decreased flight productivity. If we compare the work of two crews which apply the same quantity of chemicals to 100,000 hectares but the fields are 5 and 15 kilometers distant respectively, it appears that accrued flying time for the second crew is double that of the first, that labor productivity is greater by a factor of 1.5 for the second crew, that the cost of 1 flight hour is 20 percent less, i.e., that indicators are better than for the first crew whereas the cost of treating 1 hectare and expenditures in general are considerably greater.

The elaboration and study of the basic aspects of the system and its practical implementation continued in 1983. Most of the attention was focused on the economic preparation of the flight crew, on clarifying the shortcomings of previous systems of planning and wage payments and on the importance of discovering internal production reserves. The command-management staff of the administration travelled to aviation enterprises more than once to conduct group and individual discussions with workers. Strict controls were established over the adherence to AKhR technology, especially over the norms for the consumption of chemicals and the use of all agricultural airports.

These measures yielded positive results. In 1983 the plans for aviation-chemical operations were fulfilled and overfulfilled; about 600,000 hectares were treated beyond the quota. The main indicator of the effectiveness of aviation technology--productivity of flights--increased by 19.8 percent, which was achieved thanks to a drop in the norm of expenditure of chemicals (without a loss of effectiveness) by an average of 11 percent and a curtailment of hops by 1.3-2.3 kilometers. A savings was achieved in flight time (on An-2 planes--16,715 hours, on Ka-26 helicopters--135 hours, on Mi-2 helicopters--540 hours) and in aviation fuel (2,660 tons); the cost of 1 hectare decreased by 20.9 percent as compared to the plan and by 2.1 percent as compared to 1982 levels, the cost of 1 ton-kilometer decreased by 15 and 1.5 percent respectively. Labor productivity increased by 0.7 percent in the administration as a whole, thus freeing 64 workers, and the savings in the wage fund equalled 194,000 rubles. The total economic effect of introducing the new system of management was over 1.5 million rubles.

Effectiveness in terms of the national economy is actually even greater. In kolkhozes and sovkhozes it is based on an increased productivity of grains and other crops (thanks to the optimization of schedules for applying mineral fertilizers and for utilizing pesticides), on a decrease in payments to aviation enterprises (as a result of the curtailment of flight distances to plots being treated) and on a decrease in material and labor expenditures when servicing airplanes and helicopters. In aviation enterprises increased effectiveness is achieved as a result of curtailing the maneuvering of aviation technology and of decreasing the number of people in command-flight crews and

the number of engineering-technical workers. The new system forces aviators to seek out internal production reserves, to utilize the rotation method more extensively, to treat several sections simultaneously and to utilize highly productive equipment.

As already noted above, with the previous system of wage payments when a more productive apparatus was used the wages of the crew decreased because of the large proportion of expenditures of work time to service aviation technology on the ground. In other words, a paradoxical situation developed--the flight crew carried out more complicated flights, expended more labor and treated a larger area but was materially stimulated to a smaller degree. In the methodological instructions on wage payments we included a correction for rates per hectare when working with the new apparatus in order to reimburse for labor in accordance with the work contribution and end results. On the whole, average wages for the flight crew have practically not changed as compared to last year. At the same time, there was a considerable increase in the average wages of crews which utilized highly productive equipment and progressive technological methods to a higher degree, which demonstrated creative initiative and which secured a better organization of flights.

In order to increase the interest of aviation technologists in increasing work volume we have made proposals about wage payments to the technical staff depending upon the per-hectare wages of the airplane's or helicopter's commander and about increasing hourly rates for the flight crew when new and more productive equipment is used.

Despite the fair work results for 1983 on the whole, the possibilities of the new system were not fully realized. The freed labor resources and aviation technology could have been directed to treat no fewer than 900,000 hectares, thereby substantially decreasing the number of planes that were sent from other administrations and increasing labor productivity. This reserve will be used by us this year and in the future.

To a certain degree, the fact that the volume of aviation-chemical work is not as yet included in the plan for associations of Sel'khozhimiya [Agricultural Chemical Association] is a hindrance to the effective use of agricultural aviation. Our administration and Belsel'khozhimiya [Belorussian Agricultural Chemical Association] have taken the first steps in this direction. A joint order has been issued concerning inclusion of the volume of work performed by aviation in the plans for the production-financial operations of oblast and rayon associations of Sel'khozhimiya. We feel that this important national economic question must be dealt with on a national scale.

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## IMPORTANCE OF SEED TREATMENT

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p 7

[Article by V. I. Aniskin, director of the VIM [All-Union Scientific Research Institute of Agricultural Mechanization] Department of Post-Harvest Treatment and Storage of Grain: "A Comprehensive Solution to the Problem of Treatment"]

[Text] The significance of seed treatment as an effective method in combatting plant diseases is well known. However, the process of introducing it into the practice of seed farming has been unjustifiably prolonged in this country. Even now this important technological operation has not become as obligatory as, for example, soil preparation, sowing or harvesting. Significant areas are sown with seed that has not been disinfected or that has been disinfected with poor quality. But after all, the effect of treatment is equivalent at least to the effect on the harvest of quality soil cultivation or to the sowing of the optimal quantity of seed.

The experience of many enterprises, rayons and oblasts attests to the fact that the treatment problem can be solved. The general negative evaluation of the situation presented sometimes by individual specialists, including in print, is hardly correct.

First of all a precise coordination of efforts by various organizations in many departments is needed. At the present time, in particular, attempts are being made within the framework of a purposeful comprehensive program called Zerno to correlate inter-departmental work on developing technical means for treating seed. But this is only one aspect of the multi-level problem, which includes the search for promising preparations, providing a foundation for expenditure rates and types of equipment, elaborating a zonal technology, bringing greater precision to norms for technological planning of flow lines and seed treatment points and developing and introducing methodological recommendations on seed disinfection in agricultural enterprises with a consideration of the safety of service personnel and of preventing environmental pollution. Solutions to such problems require the careful coordination within departments, along the lines of the USSR MSKh [Ministry of Agriculture] and VASKhNIL [All-Union Academy of Agricultural Sciences imeni V. I. Lenin] (VIM, VIZR [All-Union Institute for the Protection of Plants], TsITEPsel'khoz-zerno [Expansion unknown], TsNIIPtitseprom [Central Scientific Research Institute of the Poultry Processing Industry] and others), as well as between departments.

Until recently there was no research into promising technology or a scientific basis for agrotechnical requirements. The existing fleet of equipment is represented primarily by the PSSH-5 and PS-10 mobile seed treatment machines, which were earmarked for use on the threshing floors of enterprises or in storehouses. The orientation toward this form of organization--more labor-intensive and less effective and perfected in technological terms--resulted in the separation of disinfection operations and the system of post-harvest seed processing. Meanwhile, the practical experience of a number of countries has confirmed the expediency of a technological and technical solution in which the disinfection operation becomes a mandatory element within the system of the post-harvest seed preparation and which is often performed in a single process. For this purpose, the corresponding disinfectants (including film-forming mixtures for seed incrustation) and stationary equipment are required.

Seed treatment in stationary equipment has indisputable advantages. It is possible to fully mechanize and automate the process, to provide the necessary sanitary-hygienic work conditions for service personnel and to improve the quality of disinfection considerably. It is no accident that it was the stationary method that was preeminently developed in seed-treatment enterprises of the USSR Ministry of Procurement as well as in a number of foreign countries (in Austria--by the firm Khaid, in the FRG [Federal Republic of Germany]--Gomper and Reber, in the USA--Gustafson, in Sweden--Panogen, and others). Equipment of this type is very promising in our country's agriculture as well in connection with the organization of seed farming on an industrial base. It should be said that in recent years energetic measures have been taken to develop and introduce this.

VIM has developed the agrotechnical requirements for sets of stationary disinfection equipment with a productivity of 10, 20 and 40 tons per hour in which improvements have been made in the indicators of technical level, quality of treatment and in the sanitary-hygienic work conditions for service personnel. The experienced collective of GSktb [State special design office for technology] of the agricultural equipment association is producing samples of machines. The experience of technological planning of treatment points has been generalized; corresponding recommendations for planning organizations have been prepared. Scientific institutions (VIM, the Latvian SKhA [Agricultural Academy], VNIIZR [All-Union Scientific Research Institute of Grain], TsNIIIMESKh [Central Scientific Research Institute of Rural Mechanization and Electrification of the Non-Black Earth Belt of the USSR] and others) have developed zonal technologies for seed treatment. The goal is to achieve the required treatment effect with a minimum of expenditures while considering local conditions. The technology of flow treatment of seed using stationary equipment must be more widely used in treatment points and departments or in the lines of seed-processing enterprises.

Depending on concentration, specialization and volume of seed production, treatment can be organized on the basis of intra-enterprise or inter-enterprise centralization. Variations are being developed for treatment technologies with the unloading of treated seed into special transport vehicles, into bunker storehouses, into equipment for packaging and into storehouses for the packaged storage of treated seed.

The most rapid assimilation of production of the above-mentioned sets of stationary equipment is essential, as is that of special covered large-capacity automatic loaders for seeders and modular units of metal silos for storing treated seed. Agrotechnical requirements, which were discussed above, stipulate that the stationary equipment that is produced be universal, i.e., capable of working not only with traditional preparations but with new ones, including film-forming, as well. This is why the chemical industry must accelerate the delivery of more effective preparations to agriculture.

The attitude toward seed treatment must be similar to that toward a matter of great national-economic significance. I feel that the starting point should be to eliminate possibilities for the sale of non-treated seed via legislative means.

Of course, the material conditions for fulfilling this kind of requirement must be provided. The assimilation of the production of more promising technical means will occur, apparently, by the end of the 1980's. In the coming 5 years the basic burden will fall, as before, on PSSh-5 and PS-10 mobile treatment units. Nevertheless, agriculture is supplied with only 50 percent of the units it needs. It would be logical to bring up the question of expanding their production.

Finally, it is essential to provide guarantees of the efficient use of promising scientific and design potential. Despite the development of test models of stationary disinfection units, the possibility of mass producing them has actually not been evaluated and established. Already now we should deal with the problem of allocating corresponding production capacities and begin preparing for the production of promising disinfection technology.

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## COTTON PROTECTION SYSTEM

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 pp 10-12

[Article by M. S. Mamedov, chairman of PNO [Scientific planning section] of Azersel'khozhimiya [Azerbaijan Agricultural Chemical Association] and A. Yu. Veliyev, deputy director of the republic's plant protection station: "A Comprehensive System in Operation"]

[Text] In Azerbaijan boll and other gnawing cutworms, web mites, aphids, thrips, cutworm moths as well as wilt, root rots and bacterial blight bring great losses to cotton. Within the complex of measures to combat these in the republic are: agrotechnical methods which suppress pests and diseases and which raise the activeness of useful entomophages, and biological and chemical protection methods which supplement each other. During the fall, winter and spring periods protective measures are directed at eliminating pests, disease agents and weeds in their wintering stages. During the vegetative period the protection of cotton is built on the basis of evaluating the economic thresholds for damage done by the boll worm, the web mite, the aphid and others.

In each rayon and enterprise staffs are created during every extermination season to combat pests. As practice shows, this form of management secures a fuller adherence to the principles of a comprehensive system of plant protection and of protecting the environment from pollution. An important place is given to diagnosis and prognosis. In the republic there are 53 signal and prognosis points, with each one serving from 12 to 22 enterprises. Moreover, in order to take stock of the appearance and development of pests one investigator is assigned to every 100 hectares of crops.

Scientific workers and highly trained specialists in the area of plant protection are assigned to all cotton-sowing rayons in the republic. All measures to combat pests, diseases and weeds are carried out under their methodical supervision. Recertification every 2-3 years is of great significance in improving the skills of plant protection workers.

During the fall-winter period short courses are organized for the training of signal men-accountants, investigators, tractor-machine operators, chemical workers, brigade leaders, directors of mechanized detachments and links, plant protection workers and other cadres of mass occupations. Specialists from

plant protection stations and signal points are retrained in courses for upgrading skills at the Azerbaijan Agricultural Institute as well as in other higher educational institutions in the country. Seminars on questions of plant protection are organized for workers of the middle link in agricultural production and for specialists and directors of kolkhozes, sovkhozes and other enterprises belonging to the RAPO [Rayon Agro-Industrial Association]. In 1983 there were 36 such seminars in various rayons of the republic.

In 1981-1982 new tactics were introduced in the republic to protect the harvest, based on careful and numerous surveys of fields and of road shoulders and irrigation canals surrounding crops in these fields.

In early spring we begin examining the fields to more precisely determine the number of boll worm cocoons that have overwintered. On the basis of phenological observations of the development of this pest and its population density in crops, and with a consideration of its harmfulness threshold, decisions are made in a differential manner with regard to further measures that should be taken, including chemical processing. The following thresholds are accepted here for the boll worm: for the first generation--5-6 young caterpillars or 10-15 eggs per 100 plants; for the second--10-12 young and average-aged caterpillars or 25-30 eggs. During the period of the flight of butterflies of the boll worm surveys are made of fields every 3 days, and during the period of beginning egg-laying--every other day. If the density of the pest is greater than the threshold, a signal is given for immediate treatment. The cost of survey work per hectare of fields is 20-30 kopecks per season. Expenditures for chemical protection decrease by a factor of 2-3 as a result of this method. The treated area in the republic as a whole, calculated on the basis of one-time spraying, decreased by 600,000-800,000 hectares.

The introduction of an integrated system is accompanied by an increase in the proportion of ground treatments. Over 2,000 ground units are used in cotton fields. However, not all enterprises in the republic are fully supplied with sprayers.

At the present time chemicals are used only on plots where the density of pests exceeds the threshold with a consideration of the population density of entomophages; moreover, preference is given to pesticides with systemic and selective action. Thanks to the new technique for preserving the harvest the number of treatments was decreased almost threefold--from eight in 1978 to 2.4 in 1981 and to 2.5 in 1982. In rayons such as Yevlakhskiy, Kasum-Ismaylovskiy, Sal'yanskiy, Agdzhabedinskiy and Imishlinskiy the number of treatments decreased to 1-1.5 in 1982-1983.

The curtailment in number of chemical treatments played a decisive role in preserving and accumulating useful entomofauna in cotton's agrobiocenosis. Thus, whereas in 1980 in the cotton sowing enterprises of Yevlakhskiy Rayon the quantity of useful entomofauna equalled 90-100 specimens per 100 plants, in 1981 the corresponding figure equalled 150-160 and in 1982--160-170. There was an especially noticeable growth in the number of aphid bettles, chrysops, predatory thrips and bugs as well as cabbage butterfly parasites, anilast parasites [Translation unknown], braconid wasps and so forth.

The aforementioned number of parasites turned out to be sufficient to hold back the development of dangerous insects and mites below the damage threshold on fields of cotton that were cultivated after perennial grasses and grain crops. Subsequently, it was not necessary to utilize chemicals on such fields to combat aphids and web mites.

In 1982-1983 a basically new direction was extensively developed--the use of synthetic analogs-pheromones. We were able to introduce this method due to the joint efforts of scientists from AzNIIZR [Asian Scientific Research Institute of Plant Protection] and specialists of Tartu University's All-Union NII of BMZR [Biological Method of Plant Protection] and VIZR [All-Union Institute of Plant Protection].

By using pheromones on an area of 115,000 hectares precision in accounting for harmful insects grew and reliability of predictions increased; as a result it was possible to decrease the expenditure of chemical preparations by a factor of 2-3. We have every reason to believe tha pheromone traps will become a permanent part of our plant protection service.

Highly effective microbiological preparations--dendrobacillin and bitoxibacillin--are extensively used in production. Each year they are used to treat 150,000-200,000 hectares of cotton crops. As a result of this, according to our calculations over 3 quintals of crops per hectare are additionally saved.

The extent to which useful insects are utilized is also increasing extensively. Whereas in 1979 biological agents were used on 43,600 hectares, in 1982 the figure was 90,000 hectares and in 1983--92,000 hectares. Such an increase in volume became possible as a result of the introduction into operation of the Respublikanskaya, Apsheronskaya, Kubinskaya, Kirovabadskaya, Nakhichevanskaya, Bardinskaya, Sabirabadskaya, Zhdanovskaya, Agdzhabedinskaya, Saatlinskaya and Pushkinskaya biological laboratories.

Large contributions into developing methods for using useful insects in Azerbaijan were made by scientists of AzNIIZR, the Institute of Zoology of the Azer SSR Academy of Sciences, AzNIKhI [Azer Scientific Research Cotton Institute] and a number of other institutions of the Uzbek SSR and other republics. Thanks to their work biological agents such as the following have been proposed: Trichogramma--for various populations of eggs of harmful cut-worms and other Lepidoptera; khabrobrakon [Translation unknown]--for caterpillars of boll and several other types of worms; fitomiz [Translation unknown]--for phytophages of the broomrape weed; allotrcpes and pseudo-fig--for Comstock scales parasites; and the parasitic wasp (*Aphelinus mali*)--for the wooly apple aphid.

In the republic as a whole expenditures for the struggle against cotton pests decreased by 32 percent since 1979, calculated on the basis of 1 hectare with a consideration of the number of chemical treatments and the use of the biological method.

In the republic considerable attention is focused on sanitation and preventive measures. Thus, after the completion of harvesting and before fall

plowing of fields a determination is made of the density of overwintering pests. In order to destroy them after harvesting raw cotton, cotton stems and bolls are removed from the fields with the aid of KV-4A and KV-3.6A cotton stem uprooters. After this a two-tiered plow is used to carry out plowing to a depth of 32-35 centimeters at the optimal time. This facilitates the rapid mineralization of plant remains, an increase in soil fertility and the destruction of pests (gnawing and boll worms, web mite and so forth) and of disease agents, which are plowed into the deeper soil layers and thus killed. At the present time two-staged plowing at different depths is planned in cotton-alfalfa crop rotations on fields earmarked for cotton.

In order to eliminate weeds, which act as a reservoir for pests and diseases, during the fall or winter we replow the soil deeply at the boundaries of fields for cotton and other crops, at the sides of roads and along irrigation canals; we carry out treatments with herbicides. Under our conditions dalapon (against perennial weeds) and kotoran (annual) have proven themselves well. Each year cotton raising sovkhozes and kolkhozes use herbicides against perennial weeds on 50,000-60,000 hectares; against annuals--on 120,000-150,000 hectares. They are needed on significantly larger areas. However, herbicides are allocated to us in significantly smaller quantities than we order. This is why the struggle against weeds is a serious problem.

During the winter, from 15 December to 10 February (depending on the mechanical composition of the soil), water-retention watering (winter irrigation) is carried out. This results in the compaction and freezing of the soil. As a consequence, there is a sharp decrease in the vitality of pests such as boll worm caterpillars and the overwintering forms of web mites, aphids and thrips; the vitality of the agent of wilt also drops sharply. Plots that are infected with wilt are noted on soil maps ahead of time. In the fall after crops are harvested, in addition to the aforementioned measures, deep plowing of the soil (35-40 centimeters) is carried out with the application of large doses of organic fertilizers. Then corn and alfalfa are planted on these plots. These agricultural measures activate a number of useful bacteria-antagonists to this dangerous disease in the root layer of soil, thereby facilitating a sharp drop in cotton infection and an increase in yield.

In recent years we have observed the accumulation in the soil of more aggressive strains of the causative agent of wilt, in connection with which the sick rate for cotton is increasing in some regions. To combat this disease the republic's kolkhozes and sovkhozes are giving considerable attention to assimilating cotton-alfalfa crop rotations as well as to sowing valuable predecessors such as corn, legumes, rape, perko [Translation unknown], sorghum and grain spike crops. These crops are cultivated on a high quality agro-technical background and do not become infected with wilt; this is why they are placed on very infected soil as a priority. Organic fertilizer is put into the soil in order to strengthen the vitality of microorganisms-antagonists to verticilliose wilt. In recent years active research has been conducted with regard to chemical means of combatting this disease, and some positive results have been achieved in this direction.

In a number of regions on plots that are greatly infected with wilt spraying is carried out using a 1:5 percent solution of carbamide; 70-80 percent of

the annual norm for potassium fertilizer is introduced in the soil during plowing and 20-30 percent is introduced during the budding phase of cotton. In 1983 these methods were utilized on 37,000 hectares in Pushkinskiy, Shamkhorskiy, Kasum-Ismaylovskiy, Mir-Bashirskiy, Agdhabedinskiy, Geokchay-skiy, Agdashskiy and other rayons. On this land infection with wilt decreased and productivity increased.

Positive results in protection against wilt have been noted with the application of a portion of nitrogen fertilizer (40 percent of the annual norm) in the plowed field prior to sowing during pre-sowing soil cultivation.

In combatting diseases, including wilt, the sorting and treatment of seed material is considered very important. However, for better sorting it is necessary for us to introduce into production efficient methods for delinting seed because this operation should be carried out within a special regimen that will facilitate a decrease in mechanical traumatization. Sowing material is treated in the republic with fenturam or copper trichlorphenolate centrally in cotton plants in special machines no later than 2 weeks before sowing. Treated seed is stored in kraft bags with signs saying "Treated" and indicating the name of the preparation.

Treated, tomentose seed arriving from cotton plants is moistened in water prior to sowing at a rate of 600 liters of water per ton of seed. In places where seeding material was soaked rather than moistened there were more cases of infection of cotton with gummosis.

A serious shortcoming in cotton seed farming is the fact that the procurement of raw cotton for seed purposes and the storage, preparation and sale of seed are being carried out by all 13 existing cotton-cleaning plants. They treat industrial as well as seed raw cotton, which usually results in a mixing of varieties and reproductions.

The distribution of seed-raising plots in numerous enterprises and the absence in most of them of agronomists-seed farmers does not provide the opportunity to achieve the necessary controls over the technology of cultivating and of harvesting raw cotton for seed in two stages. This has a negative effect on quality. Not always diseased plants are damaged before the harvesting of seed products begins.

In 1984 it is planned to clean and process raw cotton being used for seed purposes and without fail to disinfect seeding material using combination preparations in six specialized cotton-cleaning plants located in different zones where cotton is sown.

The practical experience of leading kolkhozes and sovkhozes has also shown that cotton which is cultivated after predecessors such as corn, sorghum, alfalfa and grain spikes becomes infected with wilt by less than half. In 1983 cotton was sown after such predecessors on 150,000 hectares.

Positive experience in joint use of organic and mineral fertilizers and in raising green manure crops has been achieved in Kommunizm Kolkhoz of Bardinskiy

Rayon (chairman G. Gasanov), Kolkhoz imeni Shaumyan of Neftechalinskiy Rayon (chairman N. Aliyev) and a number of others. It has been proven that a maximal return is achieved by the application of N150P120K80 in conjunction with the intermediate cultivation of rape as a green manure crop. Good results were noted with the combined use of manure and mineral fertilizers and with the application of compost, phosphorus and potassium fertilizers during fall plowing.

Agricultural aviation plays an important role in the struggle against pests and diseases of agricultural crops, including cotton. Each year 100-105 airplanes work on cotton fields. Thirty four simplified takeoff-landing strips have been built and put into operation. Storehouses for mineral fertilizers and pesticides, general service facilities, facilities for making solutions and other types of facilities have been built on aviation platforms. Rayon stations for plant protection control quality and adherence to the technology of safety and industrial sanitation in aviation-chemical operations in kolkhozes and sovkhozes. In contrast to past years, agricultural aviation is being serviced by specially-created detachments of rayon divisions of Sel'khozhimiya [Agricultural Chemical Association].

AzNIIZR scientists are working on the development and perfection of highly productive small-volume ground sprayers. Previously existing OVKh-14 cotton sprayers were redesigned and an OVKh-14A machine was developed without a free-swinging nozzle; its productivity is double that of the OVKh-14. Savings from the introduction of one OVKh-14A without the free-swinging nozzle equals 2,000 rubles annually. In 1983 1,203 OVKh-14A machines were used on cotton.

Progressive technology in cultivating cotton combined with protective measures have enabled the following enterprises to surpass the 40-50 quintal mark: Kommunizm, Moskva and Azerbaijan kolkhozes of Bardinskiy Rayon, Kolkhoz imeni 20 Parts"yezd and Tadzhikistan Kolkhoz of Agdzhabedinskiy Rayon, imeni Shanskayat and imeni M. B. Kasumov kolkhozes of Saatlinskiy Rayon, imeni V. I. Lenin and imeni 26 Bakinskikh Kommissarov kolkhozes of Sabirabadskiy Rayon, Sovkhoz imeni Sevil' Kaziyeva and imeni Shauman and Azerbaijan kolkhozes of Zhdanovskiy Rayon, imeni 1 Maya and imeni Shauman kolkhozes of Neftechalinskiy Rayon, Mugan' Kolkhoz and Kolkhoz imeni K. Samedov of Sal'yanskiy Rayon, imeni Kalinin, imeni B. Kasumov and imeni Lenin kolkhozes of Imishlinskiy Rayon, and others.

Long-term practice shows that all of the aforementioned organizational, agro-technical, chemical and biological measures directed at achieving large harvests and at preventing losses due to pests, diseases and weeds are suitable for and completely accessible to every enterprise.

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## BIOLOGICAL METHOD OF PLANT PROTECTION

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 pp 12-14

[Article by V. G. Kovalenkov, department director at Tajik NII [Scientific Research Institute] of Farming: "The Biological Method in the Integrated Protection of Cotton"]

[Text] The integrated system for protecting cotton used in Tajikistan is the result of a sequential solution to a number of problems.

First of all, there was a change in the approach to the chemical method--economic thresholds for the harmfulness of insects and schemes on alternating pesticides from among various groups of compounds were developed and introduced, and selective controlled treatment of fields was introduced. The effect of such an approach was evident not only in the preservation of the harvest but also in the decrease in pesticides expended and airplanes utilized as well as in an improvement in the natural environment. In the republic cotton is treated 1.5-2 times instead of 5-6 times to counteract the boll worm and 0.5-1.2 times instead of 8-10 times to counteract the web mite.

Secondly, with the decrease in pesticides in the fields there was an increased possibility to make a transition to the biological protection of the harvest.

Specialists from the Tajik NII of Farming determined the role of the natural enemies of the pests of cotton and other associated crops (corn, alfalfa, vegetables). The most effective for cotton's agrocenosis were selected--Chrysopidae, khabrobrakon [Translation unknown], cabbage butterfly parasite, tachina flies [Larvaevoridae], carabide, predaceous orius [Translation unknown] bug, stetorus [Translation unknown] beetle, thrips toxic to mites, and lady bugs. A thorough analysis was made of the methods that activate the activity of natural entomophages. In particular, it was established that in May-June, for example, when the formation of the communities of Arthropoda takes place, just one run by a tractor decreases the number of Chrysopidae by 7-14 percent and the number of aphids--by 20-37 percent (this occurs as a result of mechanical destruction, trauma to six-legged insects and their flight to other fields). By combining several technological operations the number of tractor runs in the fields can be decreased by a factor of 2-2.5, and this has a favorable effect on healthy entomofauna.

The preservation and activation of entomophages is facilitated by the treatment of cotton fields with pesticides with a consideration of thresholds of harmfulness (infestation of plants with aphids and web mites equivalent to 2 points, with 10-12 caterpillars of the boll worm per 100 regular-fiber plants and 3-4 per fine-fiber cotton, one caterpillar of the winter cutworm per 1 square meter and 5-percent density of the cutworm moth in plants).

The treatment of foci of disease, field edges and strips with insect-acaricides using the ground method facilitates the accumulation of useful insects in the fields--they move to non-treated plots and even migrate to neighboring fields.

A large role in preserving entomophages is played by the use of preparations having selective action. We know, for example, that cotton is infested with a complex of sucking and gnawing pests. Insecticides to be used against them should be selected in such a way as to make sure that useful insects are not affected while harmful ones are destroyed. Pesticides with selective action include fazalon, kel'tan, akreks, pliktran and omayt.

In tests conducted by the institute in Parkharskiy, Moskovskiy, Pyandzhskiy and Tursunzadevskiy rayons on a background of a 170-220-fold predominance of the web mite over the mite thrips and stetorus beetle, the seats of infestation were treated with kel'tan, akreks, pliktran and omayt. In 7 days the ratio of predators to pests already equalled 1:44, 1:17, 1:14 and 1:10 respectively. These acaricides can also be used on fields where *Trichogramma* and *khabrobrakon* are found.

A significant number of entomophages accumulate on acreage allocated for seed alfalfa. Here they multiply and then move to cotton and other crops, creating a dependable barrier to pests.

In speaking about the activities of natural entomophages it is essential to discuss their level of effectiveness. The indicator for the number of basic parasites and predators per 100 cotton plants, equal to 250-300 specimens, was determined by M. N. Narzikulov and Sh. A. Umarov (1981) to be a criterion for making the need for any means of protection superfluous.

There has also been a change in the approach to the traditional direction of the biological method of seasonal colonization of insects, particularly *Trichogramma* and *khabrobrakon*.

*Trichogramma* is effective against the boll, winter, alfalfa, black shouldered and wild cutworms, the leukaniye [Translation unknown] and tsirkumfleks [Translation unknown] cutworms. Whereas previously the republic used breeds of egg-eaters imported from other regions of the country, now local *Trichogramma euproctidis* is used (identified by A. G. Sorokina). Its biological and ecological indicators are much higher than those of the imported breeds; although indicators of effectiveness fluctuate according to years, ecological zones and generations of the boll worm, they are sufficiently high. The optimal norm for releasing the egg parasite has been recognized to be 60,000-70,000 per hectare.

As we know, a weak point in using Trichogramma is its unstable effectiveness. In releasing the egg eater the correct selection of tactics for distributing it with a consideration of the ecological characteristics of every zone and the special features of the crop being cultivated is very important. The parasite in the field, finding itself in new conditions, interacts with many factors which either raise or limit his effectiveness. Since the local type of Trichogramma always squeezes out other types, every production biolab should be oriented toward breeding only the local type.

In the republic a standard has been elaborated for *T. euproctidis*, which includes the following indicators: one female infests 55-62 host eggs, the percent of infection is 90-92, and 80-85 percent of them escape at adult egg eaters with a sex index of 1:2. In one gram of such biomaterial there are 44,000-50,000 females and the number of traumatized specimens is not higher than 3 percent. The norm of field use is calculated only on the basis of females.

Before beginning field distribution of the Trichogramma infested fields are singled out and the density of the pest and vitality of eggs are determined. In places where per every 100 plants up to 20 boll worm eggs are counted 28-22 percent of them are devoured by parasites; where there are 30-70 eggs--40-67 percent, which can be explained by the difference in frequency with which the parasite and host meet. With a small number of worms the chance of meeting a Trichogramma and thus the percent of eggs destroyed by parasites, decrease. If there are fewer than 20 eggs per 100 plants, the number of Trichogramma released per hectare increases from 60,000 to 70,000-75,000.

The egg eater selects only vital host eggs for infestation. Most often 40-60 percent of caterpillars of the boll worm survive the egg stage. If this figure falls to 30-45 percent it is not expedient to utilize the parasite since the pest population will not exceed the tolerable threshold and the effect of the Trichogramma will be insignificant.

The activeness of the released entomophage depends on the microclimate in the zone of the cotton plant. A temperature of 32 degrees and a relative atmospheric humidity of 35-40 percent are critical and decrease the effectiveness of the parasite. Irrigation decreases the temperature by 3-12 degrees and increases atmospheric humidity by 30-40 percent in the zone of the plant. If Trichogramma are released in the evening or during the night and then irrigation is carried out, the effectiveness of the release is increased by a factor of 2-3.

Distribution methods also have a great effect on the egg eater. The spot method, for example, does not secure full control over the host on the part of the entomophage. The institute has substantiated the advantages of continuous dispersion of grain moth eggs infested with Trichogramma (pre-imago stage) 3-5 hours prior to the release of the egg eater. For this a mixture of worm eggs and wood shavings is prepared in the fields and distributed by hand (rate of 4-5 kilograms per hectare) or with an OPKh-14 spraying attachment (rate of 9-12 kilograms per hectare). It should be said that the indicator of effectiveness is 4-10 times higher with these methods than with the distribution of Trichogramma on paper cards or together with leaves.

In Tajikistan the Trichogramma is active no more than 2 days and after that the number of eggs infested by it falls sharply (to 1.5-5 percent) and it has no more practical importance. In order for the egg parasite to control the entire period of egg-laying of one generation of boll worms (20-24 days) it must be released three or four times.

The second object bred under laboratory conditions for protecting cotton is the khabrobrakon. The specific conditions for its use are based on the following.

During breeding it is essential to maintain the optimal temperature (28-30 degrees), humidity (60-70 percent), ratio of components (chippings and meal at a 1:1.4 ratio) in an environment for raising the laboratory host--the mill moth. All of this will achieve a sex index of 1:1.5 (predominance of females).

Glasses with insects are taken into the fields moving along a diagonal and opened at a density of every 5-6 points. The released parasite distributes itself on plants and adapts rapidly to natural conditions--it feeds on nectar and the hemolymph of victims, couples and actively seeks out the caterpillars of the boll worm, penetrating into infested fruit. It is especially important to settle correctly the first batch of insects, which will reproduce, reach a certain population and begin noticeably destroying the boll worm. Subsequent releases will strengthen the natural population. According to the density of parasites in the fields, the number of caterpillars destroyed will increase consistently and will stabilize at a level of 60-80 percent.

Taking into account the capability of khabrobrakon to produce 2.5 generations during the same time that the pest is producing one generation, we should orient ourselves not toward one-time but toward seasonal release norms: for cotton-- 800-1,000 specimens per hectare; for tomatoes, other vegetables and corn-- 600-700. Effectiveness indicators do not change if this seasonal quantity of biomaterial is distributed in portions 5-6 times. In this case it is possible to produce the entomophage uniformly in laboratories and to treat a large area in a short period of time.

A mandatory measure in supporting the activeness of Trichogramma and khabrobrakon is their passage through natural hosts. In order to attract and accumulate, and subsequently collect eggs and caterpillars as well as the entomophages themselves it is recommended to develop a maternal reservoir (the methodology is described in the journal ZASHCHITA RASTENIY, 1983, No 12).

The optimal schedule for distributing laboratory parasites is determined with the help of sticky traps with the sexual pheromones of the boll worm--if the daily catch per trap reaches 3.2-4.5 butterflies (which corresponds to the presence of 7-15 eggs and 3-7.6 caterpillars per 100 cotton plants) it is time to begin colonization with the entomophage.

During the period of development of the second generation of the boll worm in July, due to extreme temperatures the Trichogramma is not capable of seriously affecting the pest population. To suppress the pest we have proposed schemes for coordinating biological and chemical means adapted for various

zones. According to the proposals, in the southern rayons of the republic (Kulyabinsk and Kurgan-Tyube oblasts) Trichogramma is used against the first generation, one of the insecticides (sevin, fozalon, tiodan) is used against the second generation and a microbiopreparation of dendrobacillin is used against the third. In the central (Gissarskaya Valley) and northern (Leninabad Oblast) regions two variants have proven themselves: 1--Trichogramma-insecticide-Trichogramma; 2--Trichogramma-insecticide-Trichogramma + dendrobacillin. The microbiopreparation is used if boll worm caterpillars of the third generation exceed the harmfulness threshold.

The distribution of Trichogramma during the first half of the vegetative period not only decreases the number of host eggs but also facilitates the accumulation of natural entomophages.

As science and practice attest, for the full-value protection of the cotton harvest it is important to biologically control other crops as well. Thus, it is essential to distribute Trichogramma in the spring (April, May) to combat winter, boll and other worms on growing alfalfa, on tomato seedlings transplanted in the fields, on Bulgarian peppers, eggplant, corn as well as weeds on the sides of roads, fields and irrigation machines and on field boundaries. The release rate is 50,000-60,000 per hectare, 2-3 times. This allows us to decrease the number of pests in their spring reservoirs prior to the beginning of the budding phase in cotton and hinders the colonization of plants by the worms.

During the vegetative period in central and northern regions the combination of releasing Trichogramma (180,000-240,000 per hectare against the first generation and the same number against the third generation of the boll worm) and khabrobrakon (according to aforementioned rates) is sufficiently effective for all crops.

For rapidly-maturing tomato varieties which are infested with the boll worm before other crops and where the pest accumulates in May-June, the following scheme is recommended. Against the first generation of the pest there should be 2-3 releases of the egg eater plus treatment with dendrobacillin 5 days after the last release; against the second generation--release of khabrobrakon; against the third generation--3-4 releases of Trichogramma plus khabrobrakon. In this scheme the number of eggs decreased by 44-70 percent and damage to caterpillars increased in the following sequence: 6-7 days after the first release of khabrobrakon--up to 30 percent, 10-14 days later--up to 50 percent, 20 days later--up to 63 percent, and subsequently--up to 82 percent.

On corn temperature does not have a negative effect on Trichogramma due to the tall height and great mass of the plant. For protecting the crop a three-fold distribution of the egg eater (180,000 per hectare) during the period when eggs are first being laid and treatment with dendrobacillin during mass egg-laying and development of caterpillars on ear fibers are sufficient. In this case, 44-65 percent of eggs and 32-70 percent of caterpillars perished.

Another special feature of distributing entomophages is that their effectiveness is affected by the size of the field. In 1977-1983 with distributions

on 180-760 hectares we noted a differentiation in parasitizing--on 62-74 percent of crops within the center of the land mass Trichogramma infested 48-62 percent of eggs, and khabrobrakon--49-82 percent of caterpillars; on 14-20 percent of the area situation nearer the edge the corresponding figures were 39-51 and 36-69 percent respectively; in the edge zone on 12-18 percent of crops adjoining fields, where the biological method was not used--28-43 and 15-56 percent respectively. Consequently, the larger the land mass on which the entomophage is distributed, the higher and more stable the indicator of parasite effectiveness. The spread in these indicators is minimal if Trichogramma and khabrobrakon are dispersed simultaneously on several crops with common boundaries (their variety increases the vitality of entomophages).

One of the ways to decrease the chemical load on fields involves the use of microbiopreparations of dendrobacillin and bitoxibacillin. Tests have enabled us to determine sufficient periods of action (12-15 days) and post-action (10-15 days) with regard to the boll worm and non-toxicity for parasites; and to differentiate according to zones the norms for preparation rates in southern regions: dendrobacillin (titer of 40 billion per gram)--2.5-3 kilograms per hectare, bitoxibacillin (55 billion per gram)--3-4 kilograms per hectare; in the central and northern regions--2-2.5 and 3-3.5 kilograms per hectare respectively. Recommended for use against the winter cutworm is dendrobacillin in a dose of 2.5 kilograms per hectare; against leaf-gnawing caterpillars--2.5-3 kilograms per hectare. The effectiveness of microbiopreparations is strengthened if irrigation is carried out after treatment with them.

Experience shows that reciprocal supplementary release of Trichogramma and khabrobrakon in conjunction with treatment using insects-acaricides and microbiopreparations secures long-term control over the development of boll worm populations. Entomophages act in the role of regulating factors with a high degree of constancy whereas selectively used pesticides act on them sparingly. As a result of all of this the density of the population of the boll worm remains at a level of 3-10 caterpillars per 100 plants, and it infests a minimum of fruit elements: on cotton--3-8 percent, tomatoes--4-11 percent and corn--3-9 percent (which is 2-4 times less than if only pesticides were used). Thanks to the compensatory possibilities of plants these indicators do not negatively affect the size of the yield.

The developed schemes enable us to produce 2.8-7.1 quintals per hectare more of cotton, 30-100 quintals per hectare more of tomatoes and 13-16 quintals per hectare more of corn grain than with 2-3 chemical treatments.

The use of schemes for 2-3 years shows the transition from one-sided characterization to full integration, in which entomophages are beginning to play an enormous role.

With the use of the biological method there is a decrease in the number of caterpillars and boll worms which enter the overwintering phase. In September-October, when harvesting operations are being carried out and chemical treatments cannot be executed, khabrobrakon destroys 16-51 percent of caterpillars and dendrobacillin--55-77 percent. The number of cocoons of pests

in the fields where biological means were used decreases by a factor of 5-6; in connection with this the pace of development and the numbers of the boll worm are altered in the following year. On a background of biological protection the first generation infests cotton fields slowly; per 100 cotton plants there is a maximum of eight caterpillars and measures are not required.

In an integrated system biological means strengthen the preventative direction of protection and allow us to actively regulate the number of harmful and useful types as well as to improve the environment.

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## ADVANTAGES OF BIOLOGICAL METHOD PRESENTED

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p 14

[Article by A. T. Norkulov, senior scientific worker of the Namangan Biological Methods Laboratory of SANIIZP [Central Asian Scientific Research Institute of Plant Protection]: "Enthusiast of the Biological Method"]

[Text] In Namangan Oblast the new practice of cotton protection based on the use of low-toxicity pesticides, biological means and natural entomophages is being introduced widely. The initiator of disseminating this work is the director of the Namangan Station for Plant Protection, N. M. Yerem'yants. In a relatively short time he has been able to organize matters so that the motto "not to destroy pests but to protect the harvest" has become the work program of oblast specialists. Experienced cadres were efficiently selected and trained; the weekly collection and analysis of materials was organized to evaluate the status of the biological method in rayons. The biological struggle against the boll worm started beginning in early spring long before the appearance of the natural Trichogramma--on boundaries, edges of cotton fields and fields of vegetables crops and alfalfa the laboratory egg eater is released to counter the overwintering generation of pests, which allows us to achieve a significant decrease in the number and distribution of the dangerous insect.

These tactics has proven themselves. Even in 1983, which was characterized by especially favorable conditions for the development of cotton pests, the basic method for protecting crops was biological. There were 14 rayon biological laboratories and the Namangan Experimental Biological Factory in operation, producing 326,500 standard units of marketable Trichogramma, which enabled us to utilize the biological method on 392,200 hectares of cotton, or over 80 percent of the area to be protected.

For the 1984 season the necessary quantity of high-quality biological material has been prepared and the preventative release of Trichogramma was executed.

In 1983 the prize of the USSR Council of Ministers was awarded in Uzbekistan to a group of specialists on plant protection, including N. M. Yerem'yants, for developing and introducing the biological method into operation.

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## ADVANTAGES OF BIOLOGICAL METHOD IN PLANT PROTECTION DISCUSSED

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p 16

[Article by A. A. Baymukhamedov, senior scientific worker of SANIIESKh [Central Asian Scientific Research Institute on the Economics of Agriculture] and Kh. D. Khuzhakulov, senior instructor at TashINKh [Tashkent Institute of Inorganic Chemistry]: "The Leading Direction"]

[Text] It is common knowledge that in places where emphasis is placed on chemicals in protecting cotton the number of treatments with pesticides increases each year. Thus, in the kolkhozes of Kommunisticheskiy Rayon, Tashkent Oblast, where up until 1981 biological methods of plant protection were poorly introduced, the number of treatments with insecticides increased from 3.3 times in 1975 to 4.6 times in 1980, and in some enterprises (Leninskiy Put' Kolkhoz and Pravda Kolkhoz)--to 5.5 times. The cost of treatment reached 40-45 rubles per hectare.

At the present time in Uzbekistan, as we know, the biological method plays a special role within an integrated system of plant protection. Extensive work related to its use is being carried out in Tashkent Oblast, for example. Of available entomophages, the Trichogramma has been in use here since 1969 and the khadrobrakon [Translation unknown]--since 1978. In 1984 45 biological laboratories, specializing basically in the production of these two entomophages to combat winter, boll and other cutworms, were organized and put into operation in enterprises. In 1983 in the oblast the biological method was used to protect 302,300 hectares of cotton (in 1975--34,500 hectares), including with the aid of entomophages--177,200 hectares (in 1975--15,400 hectares).

In the republic there has been a turning away everywhere from destroying pests in habitats where they do not bring harm to the harvest, and this not only decreased the expenditure of pesticides but also encouraged the development and accumulation of useful native insects. Decisions are made about taking measures against pests in a certain area only on the basis of the results of surveys, only if pests have reached the economic threshold of harmfulness and only if entomophages cannot suppress them.

With each year there is an increase in the number of enterprises in which the biological method is the leading one. This includes, for example, the kolkhozes

of Akkurganskiy, Galabinskiy, Kommunisticheskiy, Pskentskiy and Srednechirchikskiy rayons.

Precise organization of plant protection within an integrated system under conditions of a single agrochemical service enables us to successfully combat plant pests and diseases, sharply decreasing environmental pollution with pesticides. Thus, the transition to integrated protection of cotton has enabled us to decrease the number of chemical treatments in the oblast's kolkhozes as a whole. Naturally, once the level of chemical use decreases, that of using biological means increases. In Kolkhoz imeni Lenin of Bekabad-skiy Rayon and Politotdel Kolkhoz of Kommunisticheskiy Rayon in 1975 the number of treatments of cotton equalled 4.62 and 4 times respectively, and expenditures for protecting the harvest equalled 47.4 and 44.7 rubles per hectare. In connection with the use of the biological method expenditures for protecting the harvest of raw cotton from pests decreased to 18.4 and 21.1 rubles by 1982, the number of treatments with insecticides decreased to 2.4 and 3.0 times and the number of treatments utilizing biological means increased by 3.0 and 10.3 times respectively. The use of entomophages comprised 61-90 percent of the total volume of biological protection for plants here.

Unfortunately, the integrated protection of cotton has not won a firm foothold in all enterprises by far. This is reflected to a large extent in many indicators, especially economic. Calculations show that the universal introduction of integrated protection instead of calendar treatment of all cotton crops in the kolkhozes of Tashkent Oblast would have enabled them to decrease the expenditure of insecticides by 1,280,000 rubles, or 140 rubles per hectare, in 1982 alone.

The practical experience of leading cotton-planting enterprises attests to the fact that the further improvement in work of all links in the agrochemical service and the widespread introduction of integrated protection will enable enterprises to raise the protection of the harvest from pests, diseases and weeds to a higher level.

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## EXPERIMENTAL COUNTERAGENT FOR FUSARIAL WILT DISCUSSED

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p 16

[Article by K. Saparov, aspirant, SANIIZR [Central Asian Scientific Research Institute of Plant Protection]: "Trichodermin and Fusarial Wilt"]

[Text] One of the serious diseases of fine-fiber cotton is fusarial wilt. In recent years it has begun infecting average-fiber varieties as well.

In 1980-1982 under laboratory and field conditions we studied the effect of Trichodermin on the causative agent of fusarial wilt. The infectious agents used in plants were *Fusarium oxysporum* and *F. vasinfectum*, which were propagated on steamed oats. Selected for protecting cotton was Trichodermin raised on oats (120 kilograms per hectare) and an experimental industrial preparation in doses of 5, 10 and 15 kilograms per hectare, which was applied in the spring 15 days before sowing to a depth of 35-40 centimeters for varieties 8763-1 (reference), 5904-I and Tashkent-1.

Calculations showed that during the early period, infection of cotton shoots with fusarial wilt in the experiment using fine-fiber (8763-1, 5904-I) and average-fiber (Tashkent-1) varieties was lower than in the control. At the end of June the same characteristic was retained with regard to infection with fusarial wilt. Among test variants with the 8763-N variety 36-52 percent of crops were infected, as compared with 59 percent in the control, and with the average-fiber Tashkent-1 variety--25-35 and 42 percent respectively.

The best results were achieved by the introduction of Trichodermin propagated on autoclaved oats (120 kilograms per hectare) and then by experimental industrial Trichodermin in a dose of 15 kilograms per hectare. The fungus raised the germination capacity of seed by 8-10 percent and the yield of raw cotton. A positive consequence of the preparation was noted--infection of cotton plants with fusarial wilt in the variant that included the use of Trichodermin last year was 14-16 percent lower than in variants that did not.

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CONFERENCE ON INTEGRATED PLANT PROTECTION HELD

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p 16

[Article: "Dependable Protection for Fields"]

[Text] In March a conference was held in Dushanbe for leading specialists of associations of Tadzhiksel'khozkhimiya [Tajik Agricultural Chemical Association], for workers of the ministries of agriculture and the fruit and vegetable industries of republics and for workers of branch scientific-research institutions on the problem of the integrated protection of plants under conditions of intensification and specialization of agricultural production.

As the speakers noted, in the republic extensive work is being carried out to introduce effective methods for improving the productivity of main crops, including cotton, vegetables and feed crops. The sphere of integrated protection of these crops is growing, allowing us not only to achieve a yield of full-value, high-quality harvests but also to decrease the cost of production, to curtail the use of pesticides and prevent their pollution of the environment.

At the same time it was emphasized that in a number of enterprises the biological method is still being introduced slowly and that specialized detachments for combatting pests are not being created.

The conference indicated ways to increase the effectiveness of chemization, of extensively introducing the biological method in all branches of agriculture, and to increase and efficiently utilize other means of plant protection in the struggle to increase the return on each hectare.

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## SOIL PATHOGENS OF ALFALFA

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p 19

[Article by N. M. Alpat'yev, director of the Plant Protection Laboratory of the Don Zonal NIISKh [Scientific Research Institute of Agriculture] and V. G. Artokina, scientific worker of the institute, aspirant at VINZ [All-Union Institute of Plant Protection]: "Soil Phytopathogens of Alfalfa"]

[Text] In Rostov Oblast fungi of the Fusarium variety (*F.oxysporum*--the dominant type, *F. solani*, *F. culmorum*, *F. semitectum*, *F. sporotrichiella*, *F. gibbosum*) are most widespread on alfalfa.

Fusarium is especially harmful in dry, hot years. Diseased plants gradually wilt in the course of vegetation, lag behind in height and are noticeably depressed. There is a characteristic browning of the vessels of the root's conducting system, and with extensive development--browning of the vascular ring in the lower part of the stem.

The literature provides information about the infection of alfalfa with this disease. A number of foreign and native sources (Chi, Childres, Hanson, 1964; Childres, 1966; Leath, Lukezic et al., 1971; B. V. Shal'tyanis, 1970; N. M. Alpat'yev, 1973; N. N. Terent'yeva, 1976) point to root infection of the crop during the first and second year of life, as well as during the beginning stages of the plant's development. Some authors (P. A. Lubenets, 1964; A. V. Nogovitsina, K. V. Nikitina, 1972; P. A. Lubenets, K. V. Nikitina, V. N. Shirko, 1974) assign Fusarium a secondary role and include it among the diseases of old plants; they consider phytopathogenic bacteria to be the main reason for disease.

Each year we noted the appearance of fusarial wilt at different phases in alfalfa's development. In the oblast's central rayons maximal harmfulness was usually observed during the second 10 days of June; disease foci are distributed on the fields in a localized manner or more uniformly. In 1978 mass ruin was recorded at the early stages of development of summer bare alfalfa crops of the current year which as a rule are less vulnerable than spring crops. Diseased shoots had the characteristic constriction below the root neck.

Among the agents of bacterial wilt and infection of the root system of alfalfa were bacteria of the families of *Corynebacterium* (frequency of occurrence equalled 30.7 percent in 1978), *Erwinia* and *Bacillus*. The occurrence of semi-parasitic *E. carotovora*, *E. phytophthora* and *E. aroideae* reached 57 percent during some years, and of *B. mesentericus*--93 percent. These bacteria strengthen and accelerate the decomposition of infected roots. The latter type is capable of initiating the rotting process under favorable conditions, but since it was singled out by us on plants already infected with fungi and since its frequency of occurrence increased with the increase in degree of depression it evidently plays a secondary role in general pathogenesis.

Diseased plants are characterized by a greyish-green coloration, short height, small leaves, a yellowed or browned xylem, rotting or blackened and thickened root pith, macerated tissue, darkened vessels or entire circulatory ring.

The harmfulness of the alfalfa cyst-forming nematode (*Heterodera medicaginis*) was more manifest on crops during their first year of life and was evidenced by a decrease in the yield of green mass, hay and seed and by a decrease in the thickness of the grass stand, in bushiness and in the height and leaf cover of the plant. In 1981 with pre-seeding infection of soil with 2,500 larva and eggs per 100 cubic centimeters, the yield of green mass from alfalfa decreased by 47-49 and 23-26 percent in the first and second years of life respectively.

At the centers of infection a weak, late blooming and noticeable lag in plant growth after mowing was noted. The signs of infection were most evident when the female nematode was located on roots. The first period of colonization of roots with larva began in late March-early April depending on weather conditions, the second--in mid-June, with each lasting about 60 days.

With the infection of alfalfa by nematodes a decrease in protein, carbohydrates, chlorophyll and carotene was noted in the tissue.

The fact that infection with other soil pathogens occurs at the same time as infection due to nematodes allows us to infer the existence of a certain interaction between them. The literature presents evidence about the coordination of nematodes with the agents of tracheomicosis on various crops. In most cases, in diseases transmitted by the soil nematodes are not the single disease agent (N. M. Sveshnikova, 1964; Pitcher, 1965; Brown, 1966; Meagher, 1971, 1978; R. V. Mikulina et al., 1972; V. S. Treskova, 1972; and others).

As a result of field observation we have determined that on 30-35 percent of crops that perished during the phase of shoot formation on plots of land infected with the alfalfa nematode, fungi of the *Fusarium* type can be singled out. A tie has been established (coefficient correlation of 0.78) between the degree of pre-sowing infection of the soil with the nematode and the number of plants in the third year of life that are infected with root rots (see table).

A correlation has not been established between the degree of initial infection of the soil with nematodes and the intensiveness of infection of plants with root rots. A diagnosis of disease according to symptoms cannot be considered

valid due to the similarity in signs of infection for the aforementioned pathogens individually and in a complex. For this, laboratory analysis is essential. Frequently the depression of plants due to a soil infection is supplemented by diseases of above-ground organs, as for example by variegated and yellow leaf blight, which is widespread here.

Table

Number of larva per 100 cubic centimeters of soil	Percent of plants infected with root rots	Average degree of infection
0	50	0.68
Up to 100	63	0.72
101-500	79	0.67
501-1,000	83	0.74
1,001-1,500	89	0.66

The most promising method for protecting alfalfa from soil pathogens is the introduction of resistant varieties. It has been established that all of the varieties regionalized for the North Caucasus zone become infected to a significant degree with the aforementioned diseases; however, differences in the degree of vulnerability provide the opportunity to carry out breeding work with alfalfa for immunity to soil pathogens.

To limit the harmfulness of infections and to develop a good phyto-sanitary condition of fields, the quality and timely execution of agrotechnical measures, seeding using high-quality seed, treatment of seed ahead of time with TMTD [Tetramethylthiuram disulfide], adherence to crop rotations and the availability of fertilizers are very important. Less vulnerable are wide-row sparse crops for seed under cover as well as forage crops in mixtures with cereal grasses.

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## MICROBIOLOGICAL METHOD OF PLANT PROTECTION DISCUSSED

Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p 51

[Article by R. A. Khryanina, expert of the State Committee on Chemical Means for Combatting Pests, Plant Diseases and Pests: "Microbiological Preparations"]

[Text] The biological method, especially microbiologic, is very promising for protecting certain orchard and vegetable plots of land from harmful organisms. Among the bacterial preparations recommended for use on individual sections of land are: bitoxibacillin, dendrobacillin and entobakrin. Their active origin is spores of the bacteria *Bacillus turingiensis* as well as the products of their vital activity--endotoxins and exotoxins. An endotoxin is formed within the cells of the pathogen and enters the environment after the pathogen's death. It is part of the composition of entobakterin and dendrobacillin.

An exotoxin is released into the environment by the pathogen while the pathogen is alive and is contained in bitoxibacillin. One gram of entobakterin contains 30 billion bacterial spores and the same number of endotoxin spores. Dendrobacillin is a dry powder with a titer of 30 billion bacterial spores per gram (and the same number of endotoxin crystals) and wetting powder with a titer of 60 billion spores per gram (and almost the same number of endospore crystals, as well as a stabilizer--20 percent concentrate of a sulfite-alcoholic mash and a wetting agent--5 percent OP-7 or ON-10). One gram of bitoxibacillin contains 45 billion bacterial spores and 0.6-0.8 percent exotoxin.

Entobakterin and dendrobacillin are effective only when they enter the intestines of an insect while it is eating.

Their specificity of action on caterpillars of Lepidoptera is related to the uniqueness of the digestive system of insects, characterized by a certain pH value and a combination of salts and fermenting agents necessary for the breakdown and activation of bacteria's crystallized toxins.

A toxin activated in the digestive tract results in damage to the inner membrane of the caterpillar's intestines, causing a disturbance in osmotic balance. As a result, the caustic contents of the intestine seep into the

caterpillar's body, which causes the death of the insect. This takes 1-4 days, depending on the amount of preparation eaten.

Entobakterin and dendrobacillin are earmarked for combatting caterpillars of the first and second generations of leaf-gnawing pests--apple and ermine moths, inch worm, leaf roller, silkworm moth, tussock moth, American white butterfly, pierid butterfly, brown-tail moth on fruit, cabbage and cabbage white butterflies, cabbage moth, pyralids on vegetables.

No more than two treatments are allowed per season, with an interval of 7-8 days.

Bitoxibacillin also has intestinal action, but in addition to this, because of the presence of exotoxin in it it is capable of doing critical damage to the insect during the period of molting and metamorphosis (transformation of the larva into the imago). This is why the spectrum of action of bitoxibacillin is somewhat different than that of entobakterin and dendrobacillin.

Bitoxibacillin is used against larva of first-generation Colorado beetles. On potatoes up to three treatments are executed per every generation of the pest. The first spraying is carried out during the period of mass development of larva from eggs; the second and third--at intervals of 6-8 days.

On tomatoes and peppers it is expedient to use the aforementioned preparation against larva of the second generation of Colorado beetles (up to four treatments are allowed), the appearance of which usually corresponds to the period of formation of the ovaries and the maturation of the fruit. Prior to the beginning of budding and blooming chemical preparations are more effective against first-generation larva. The interval between treatments with bitoxibacillin on these crops is also 6-8 days.

The number of treatments is determined by the density of pest populations, and the interval between treatments--by the intensity of larval development from eggs. The latter depends on hydrothermal conditions--with average daily temperatures over 20 degrees the interval is 6-7 days, below 20 degrees--8 days. The amount of preparation used should be varied depending on the temperature of the environment (see table).

The norms for expending active liquid during spraying of crops is as follows: for young trees (up to 6 years of age)--from 2 liters per tree, for fruit-bearing trees--up to 10 liters, for vegetable crops--0.5-1 liter per 10 square meters and for potatoes, tomatoes, peppers and eggplant--no more than 0.5 liters per 10 square meters.

To prepare an effective solution of microbiopreparations their necessary quantity is mixed with a small amount of water, carefully crushing all lumps until a pasty mass is formed. Then it is mixed with the necessary amount of water with constant stirring. Active suspended matter is filtered during the loading of sprayers.

Table

Crop	Expenditure norm for water (in grams per 10 liters) at the following temperature of the environment:		
	13-17 degrees and over 32 degrees	18-24 degrees	24-32 degrees
Potatoes, tomatoes, peppers	Bitoxibacillin 100	70-80	40
Vegetable	Dendrobacillin (dry powder) (Titer of 30 billion spores per gram) 60	50	40
Fruit	100	70	60
Vegetable	Dendrobacillin (wetting powder) (Titer of 60 billion spores per gram) 30	25	20
Fruit	50	35	30
Vegetable	Endobakterin 60	40	20
Fruit	100	70-90	60-70

During the preparation of active solution water temperature should be no higher than 20 degrees in order to avoid the germination of spores which are included in bacterial preparations.

Active liquid must be used within 2-4 hours.

Bacterial preparations should be used when there is no rain or abundant dew and when atmospheric temperature is no lower than 13 degrees.

The optimal temperature range for utilizing the aforementioned biological resources is 18-32 degrees.

It is recommended that treatment be carried out during evening or morning hours since direct rays of the sun partially inactivate bacterial toxins.

Entobakterin, dendrobacillin and bitoxicillin are of little toxicity for warm-blooded animals and man and are basically safe for useful entomofauna in the norms that are recommended for use. The toxicity of entobakterin and dendrobacillin for the silkworm must be considered when these preparations are used in zones where the silkworm is raised. The last treatment may take place no later than 5 days before harvesting operations.

Since the active origin of microbiopreparations is bacteria, it is essential to avoid contaminating clothes, skin and respiratory organs with them.

To achieve this, when using these preparations special clothing should be worn (cotton aprons or coveralls, boots and gloves), as well as cotton gauze masks or respirators.

The utensils in which the active liquid is prepared are washed in a soda solution (20 grams per 100 milliliter of water). They cannot be used to store food or water.

Biopreparations must be stored in a dry place. They maintain their activity in the course of the year if atmospheric temperatures are from -30 degrees to +30 degrees.

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## PLANT PROTECTION MEASURES

MOSCOW ZASHCHITA RASTENIY in Russian No 8, Aug 84 pp 56-60

[Article by V. F. Plotnikov, Yu. N. Kozitskiy, scientific secretaries of the Department of Plant Protection, VASKhNIL [All-Union Academy of Agricultural Sciences imeni V. I. Lenin]: "Summary of Scientific Work"]

{Text} In late April the annual meeting of the Department of Plant Protection, VASKhNIL, took place in Gorkiy, at which a report by N. M. Golyshin, academician-secretary of the department and VASKhNIL corresponding member, was presented and discussed.

During the year being reported on the department and institutes subordinate to it, as the academician-secretary noted, worked to deal with tasks arising from a comprehensive program on plant protection for the 11th Five-Year Plan, and occupied themselves with the introduction of scientific elaborations to facilitate the successful fulfillment of the USSR Food Program. Together with the USSR Ministry of Agriculture proposals were prepared to expand the use of the biological method to combat pests, plant diseases and weeds and to strengthen controls over the quality of pesticides and their residue in agricultural products and the environment. The basic directions for scientific-research work in 1986-1990 have been developed; various standardization materials and proposals have been readied to strengthen the struggle against smut diseases and to expand research on pheromones and plant immunity to pests.

The NTS [Scientific-Technical Soviet] of the USSR MSKh [Ministry of Agriculture] examined and approved systems of measures to protect rape, fruit in nurseries, parent sugar beet plants (prepared for the first time), spike crops in the European and Asian parts of the USSR and corn (second issue) from pests, diseases and weeds; economic thresholds of害虫ness of the most important harmful types of insects and mites; and methodological rules on determining the classification of Trichogramma via electrophoresis. Recommendations have been approved on the biological method to combat mites that poison plants and that infest strawberries, on the industrial use of certain herbicides and on the use of sex pheromones of the San Jose scale insect, Comstock scale, cabbage cutworm and peas tortrix to determine schedules for combatting them. The NTS of the USSR MSKh has examined and approved a complex of measures to combat root rots in grains.

The department buro examined the status of research and goals related to improving methods to disinfect seed and problems of immunodiagnosis in regard to developing and reproducing virus-free planting material and a promising assortment of means of plant protection to the year 2005; the status and prospects for studying and introducing herbicides; ways to activate the use of natural entomophages; possibilities for improving the production and use of Trichogramma, and so forth.

A number of intra-union and international conferences were conducted in order to improve the methodological foundation of and coordination of scientific-research work and to increase its effectiveness.

N. M. Golyshin characterized the results of leading research.

#### Prognosis and Signals on the Development of Harmful Organisms

There was a continuation in improvements in the prognostication system on the basis of distance aerospace devices; new accounts methods, automated methods for predicting population dynamics of model harmful objects and an automated system for signalling the treatment schedule of potatoes against late blight were developed. It was noted that aerospace and aerovisualization methods of phytosanitary diagnosis are being prepared and introduced slowly, especially as regards important objects such as mouse-like rodents, grain ground beetle and others. It is important to improve the methods of diagnosis, prognosis and signaling on the basis of the latest scientific achievements and industrial research, to expand the number of objects subject to prognosis and to achieve the introduction into production of automated systems and mathematical methods of prognosis.

#### Plant Immunity

The VIZR [All-Union Institute for the Protection of Plants], together with the country's breeding centers, have been working on functional models of highly productive varieties with a combined resistance to harmful organisms. Synthetic corn is being developed with a combined resistance to the European corn borer, the Swedish fly, the greenbug, Fusarial wilt, smut of corn and stem rots. A system of criteria reflecting resistance of cabbage to 12 harmful organisms (including cabbage flies, aphids, moths, white butterflies, bacteriosis and fusarial wilt) has been developed; it foresees the development of varieties with valuable economic properties (productivity of 800 quintals per hectare and more, adaptability to machine harvesting).

A more thorough study of anatomic-morphological, physiological-biochemical and ecological interrelations within the system of the plant-phytophage enabled us to discover new factors about plant immunity and to determine their place within the total immunological system.

With the goal of singling out sources of resistance an analysis of immunological properties is continuing within breeding and collection materials and regionalized and promising varieties and hybrids of spike crops, corn, potatoes, legumes, vegetables, feed crops and cotton.

over 11,000 samples have been evaluated, of which 433 varieties and lines resistant or tolerant of many pests have been singled out.

In recent years breeding work has been activated and we have seen the appearance of wheat varieties resistant to the Hessian fly and brown rust; corn resistant to the corn moth; sorghum resistant to aphids; potatoes resistant to the Colorado beetle and phytophthora; and barley resistant to powdery mildew. Still, most of the developed high-yield varieties of grains, legumes, corn, rice and other crops are susceptible to diseases and pests.

The Department of Plant Protection and the Department of Plant Growing and Selection of VASKhNIL [All-Union Academy of Agricultural Sciences imeni V. I. Lenin] must organize work on selection for plant resistance to harmful organisms on a higher level.

#### The Agrotechnical Method

VIZR has completed an evaluation of the phytosanitary status of wheat and barley in crop rotations with different saturations of grain crops. In the European part of the USSR in regions with a predominance of winter crops it is admissible to plant 50-60 percent grains; in the Asian section and other regions with a predominance of spring crops--70-80 percent grains. A large proportion of grains requires special means of protection from soil pests and pathogens, especially the oats nematode, the grain carabide, the stem borer and the causative agent of root rot.

According to data from VNIIZR [All-Union Scientific Research Institute of Plant Protection], the control of the number of phytoparasitic nematodes with the aid of crop rotation under TsUShU (Central Black Earth Region) conditions is possible only if the proportion of grains is not more than 70-75 percent. In UkrNIIZR [Ukrainian Scientific Research Institute of Plant Protection] it was determined that the density of populations of the small grain carabide and the development of root rots increases particularly sharply when winter wheat is cultivated without interruption for 3-4 years. According to data from BelNIIZR [Belorussian Scientific Research Institute of Plant Protection], the cultivation of resistant varieties and a high level of agrotechnology and phytosanitization allows us to increase the proportion of fescue in crop rotations by 7% percent without any considerable effect on the harvest and in beet saturations with the alternation of winter wheat-sugar beet (ques-sugar beets) a maximal destruction of weeds is achieved and it is possible to increase the proportion of beets to 30 percent.

In AZNIIIZR [Azer Scientific Research Institute of Plant Protection] the role of a number of growth preparations, microelements, complex and liquid nitrogen fertilizers was studied in relation to increased seasonal resistance of cotton to verticillium wilt; in KizNIIZR [Kazak Scientific Research Institute of Plant Protection] the effect of predecessors, irrigation regimes and norms for applying mineral fertilizers on root aphids and diseases of sugar beets were studied.

In recent years the volume of work dealing with agrotechnical control measures has increased significantly, but they are being developed for a relatively limited circle of crops; the effect of cultivation technology on the phytosanitary condition of crops and plants is not being studied effectively enough. Technological methods are becoming the property of widespread practical application, but their phytosanitary evaluation is fragmentary in nature. There should be a strengthening of research into the role of satiation of crop rotations with protiled crops in various zones and into the effect of soil-protection and other agricultural systems on the distribution of harmful organisms.

#### The Biological Control Method

VIZR specialists have clarified the species composition of the complex of entomophages for cereal aphids and cabbage and seed altalta pests; an annotated list of these has been drawn up for grain crops; and an analytic model to determine potential effectiveness has been worked out. A new artificial nutritive environment for propagating aphid lions, which increases the productivity of the imago by a factor of 2-2.5, has been proposed. Samples of equipment for propagating the imago and for obtaining eggs of the aphid lion have been developed and manufactured. A method for increasing protein content in seed before it is infested with moths, which increases the output of parasite eggs by 35 percent, has been developed.

In VNIIIBMZR [All-Union Scientific Research Institute of the Biological Method of Plant Protection] a technology has been perfected for propagating Trichogramma, which has enabled us to increase the productivity of biological factories by a factor of 1-2.

UkrNIIIZR has provided a foundation for the possibility of using the mill moth as a new host for Trichogramma; the basic technological parameters for its mass propagation have been established. The use of the mill moth will enable us to increase the productivity and quality of the egg eater by 30 percent. VNIIIBMZR has approved an express method for determining six types of Trichogramma in order to implement constant taxonomic control over the egg parasite. VNTIIBMZR, the Krasnoprivör NPO [Scientific-Technical Association] and the Krasnodar affiliate of GosNIIIGA [State Scientific Research Institute of Civil Aviation] have tested samples of land-based aviation apparatus for distributing Trichogramma, which has proven to be highly effective.

Technological means of cultivating pathogens and antagonists have been perfected to create, on their basis, microbiological means of plant protection. The reasons for the unstable effectiveness of a number of viral preparations have been established.

The VNII of Agricultural Microbiology has singled out over 3,000 isolated specimens, of which the following were selected: five strains-producers of bactrodenits [translation unknown]; three strains-producers of biotoxine (Bt); and two strains-producers of bacteriobacisid [translation unknown]. The selected strains are not inferior to industrial strains and sometimes are even superior to them.

BelNIIZR has completed the development of a biological method of combatting the orange white fly with the help of enkarzin [Translation unknown]; schedules, norms and the number of times certain preparations can be used in combatting a complex of Lepidoptera on cabbage have been made more precise. State testing of Virin-KSh and Virin-GYaP has been successfully completed; highly active experimental strains have been selected for industrial production.

At the same time, considerable problems exist. For example, theoretical bases for the use of the biological method in integrated plant protection, for mass propagation of entomophages and other useful organisms and for the struggle against plant diseases and weeds have not been successfully developed.

#### The Chemical Method

Attention was focused on raising the effectiveness of utilizing pesticides, on ecological and toxicological bases for their efficient use and on improving the assortment. Modern methods and technologies, harmless to man and the environment, have been developed and introduced for utilizing plant protection means on the basis of economic thresholds of harmfulness, the effective alternation of preparations, the replacement of stable highly-toxic compounds with compounds that are less dangerous and more selective. Research was done on the action of pesticides in plants being protected, on yield, processed products and environmental objects.

State testing was carried out on 212 chemicals produced in this country and abroad. Nineteen new preparations have been registered and 27 have been recommended for introduction. Their sanitation-hygienic and medical-toxicological evaluation enabled us to determine safe concentrations and periods of safe use and to move to the development and industrial evaluation of optimal use schemes within integrated systems.

There was a continuation in the selection of pesticides and in the improvement of technology related to chemically combatting dangerous and widespread harmful organisms—the locust, the shield bug, the meadow moth, the Colorado beetle, the cutworm, rust fungi and powdery mildews, smuts, root and stem rusts, phytophthora, white and gray molds of sunflowers and so forth. On the basis of obtained data, zonal systems of agricultural plant protection have been developed, made more precise and supplemented.

Chemical weeding schedules were optimized and there was a continuation of the selection of a modern assortment of herbicides for grains, legumes, industrial crops, fruit, subtropic and other crops with a consideration of zonal conditions.

The laws governing the development of harmful organisms and the biochemical mechanisms of their resistance to pesticides were worked on. Research was conducted on the subsequent action of chemicals on fauna of agroecosystems.

Chemical measures were elaborated to combat pests and diseases in stored vegetable products and agricultural raw materials. Fumigation of storehouse facilities with fostoksin [Translation unknown] has proven to be highly effective.

Nevertheless, the assortment of highly selective pesticides which are effective at minimal dosages still remains narrow. For some zones norms for the expenditure of preparations have been recommended without sufficient biological foundation; sometimes they are elevated by 30 percent and more.

#### Mechanization

Improvements have been made in the means of mechanization of technological processes of plant protection, in the working organs of machines and in various mechanisms and attachments. In VIZR a sample attachment for sowers has been developed and manufactured to dispense granules of pesticides and to place them into the ground, as well as devices of the measurement-registration complex for studying granule dispensers. VNIIZR has developed a sample piece of equipment for the OPSchch-15 sprayer for the application of liquid pesticides and testing on this equipment has begun. Preliminary drafts have been prepared for a point to prepare mixtures of mineral fertilizers and pesticides.

At the same time, the status of work in this area still remains unsatisfactory. Few modern tractor sprayers are manufactured, existing machines are not efficient and the expenditure of active liquid is high. Progressive methods of applying pesticides, such as in granulated form, in strips, in small and ultra-small volumes and the core method are being introduced poorly due to the absence of the means of mechanization.

#### New Methods of Plant Protection

VIZR has tested 40 samples of native yuvenoids [Translation unknown], of which three compounds with increased activity were selected for Coleoptera and Hemiptera. Preparative forms of yuvenoids AYuG-80A and AYuG-82A, which can be recommended for further production evaluation in combatting the white fly, have been selected.

VNIIBNZR has synthesized the sex attracting agent of the grape mealy bug and the active component in the attracting agent of the American white moth. The active components of sexual attracting agents of the pine moth and Siberian moth and the Japanese ceraceous soft scales have been identified. A liquid form of the pheromone, more effective than previously proposed solid forms, has been developed for the gypsy moth to disorient the male. Ten thousand capsules have been prepared with the pheromone of the grape-like leaf roller and 45,000 of the boll worm.

Synthetic pheromones of the grapelike, retiform, rose and willow leaf rollers have been tested in field conditions with the goal of control and signalling.

#### Improving the Systems of Plant Protection

Republic institutes of plant protection have improved regional integrated systems. In particular, AzNIIZR worked on an integrated system for the protection of cotton under industrial conditions, on the threshold of harmfulness related to the numbers of the most important pests, on the effective levels of useful fauna and on selective microbiological and chemical control

means. SANIIZR [Central Asian Scientific Research Institute of Plant Protection] has perfected an integrated system of protecting alfalfa, cotton and corn, KazNIIZR--sugar beets and soybeans for the southeastern rayons of the republic, BelNIIZR--seed crops of awnless brome grass, blue fescue, and pasture rye grass, UkrNIIZR--soybeans and sunflowers, VNIIZR--spike crops, sunflowers and vegetables in enclosed areas and GruzNIIZR--corn for eastern Georgia as well as grapes and fruits.

However, not all elaborations by far are presented as integral components of a complex of protective measures. This is why republic institutes of plant protection as well as departments of plant protection of branch and zonal institutes must pay special attention to prevention and to a harmonious coordination of various control methods, as well as to an examination of systems under production conditions.

#### Introduction of Scientific Elaborations

In accordance with the confirmed plan, in 1983 VIZR introduced 25 elaborations, including complex measures on the protection of grains, legumes and feed and vegetable crops from pests, diseases and weeds. The implementation of these systems will enable us to preserve over 20 percent of the harvest and more.

New preparative forms of disinfectants, including in film-forming mixtures (on a total area of 4 million hectares), which were developed by the institute, an improved system of alternating insecticides and acarids against a complex of cotton pests, low-volume and ultra-low volume spraying of field, feed and fruit crops, protective vaccinations of tomatoes in hothouses and the technology for utilizing pheromone traps to calculate the density of the lesser apple worm and other pests were widely introduced.

VNIIBMZR introduced 15 elaborations and 21 underwent experimental-production testing. This included the integrated protection of grapevines against pests and diseases (on an area of 150,000 hectares); pheromone traps to evaluate the lesser apple worm, the grapelike leaf roller, the boll worm, the gypsy moth, the nun moth and potato moth (960,000 hectares); recommendations on the mass propagation, use and storage of Trichogramma (220,000 hectares) and on the use of the verticillium fungus in controlling the orange white moth (145 hectares); a methodology for determining the economic effectiveness of using biological means for plant protection (in all republics of the country).

The All-Russian NIIZR in the Central Black-Earth Region and a number of oblasts of the Northern Caucasus have introduced technological maps on plant protection, a technology for the preparation and application of liquid complex fertilizers and pesticides, new methods of mapping and predicting weed infestation of crops, recommendations on the use of pheromone traps and a number of other elaborations.

UkrNIIZR introduced a system for protecting grains, sugar beets, potatoes and fruits from pests and diseases, the UMO [Ultra-low volume spraying] method against a complex of pests of sugar beets, potatoes, fruit and clover

seedlings, the economic thresholds of harmfulness and various biological means of combatting pests of field, fruit and vegetable crops (on a total area of 957,000 hectares).

BelNIIZR introduced 22 scientific elaborations on a total area of 322,700 hectares, and KazNIIZR--11 elaborations. Significant work has been carried out in SANIIZR, in the Georgian NIIZR, the Armenian NIIZR, the Asian NIIZR and in SibNIIZh [Siberian scientific research institute of chemical protection].

Nevertheless, work on introducing completed scientific elaborations into production must be activated.

As N. M. Golyshin noted, science has a debt to production, it must provide production with improved and more effective measures to control root rots in grains, gray and white molds on sunflowers, bacterial, nematode and viral diseases, the Colorado beetle, the chinch bug, the grain carabide, locusts and other polyphagous pests as well as many types of weeds. We need improved integrated zonal control systems that will consider the special features of industrial cultivation technologies and new energy-saving farming systems.

All elaborated measures must be organically written into the specific process for cultivating crops; they must be outstanding not only for their high degree of economic effectiveness and be less labor and energy intensive.

At the conference there was a report on the scientific work of VASKhNII corresponding-member V. F. Peresypkin, under the leadership of whom the Department of Phytopathology of USKhA [Expansion unknown] has been researching the resistance of wheat, rape and peas to diseases and pests. Singled out were 14 forms of winter wheat, characterized by a high degree of resistance and productivity; eight of these were given to breeding centers in the Ukraine. The variety Mytnitskaya-201, characterized by immunity to all forms of rust and by relative resistance to root rots, cereal flies and grain saw-flies, is undergoing state testing. Coming to an end is intra-station testing of the semi-dwarf Goloseyevskaya winter wheat variety, which is immune to all forms of rust and covered smut, has average resistance to powdery mildew, is highly resistant to root rots and septoria and is slightly vulnerable to cereal flies and grain saw-flies.

In cooperation with other scientific institutions of the republic a new variety of winter wheat, Kiyanka, was developed and regionalized in eight oblasts of the Ukrainian SSR. The variety is a semi-dwarf, does not lodge and is characterized by complex resistance to several diseases and immunity to yellow rust. Five new varieties of winter and spring rape, highly resistant to bacteriosis of the roots and to downy mildew, have been developed. Work is being carried out to obtain resistant strains of peas.

The director of KazNIIZR, T. N. Nurmuratov, and a department director of the institute, N. Ya. Yevdokimov, reported on changes in the species composition and in the dynamics of population densities of harmful organisms in the agrobiocenoses of field crops with the soil-conservation system of farming in the

Kazakh SSR. The system's effect on the formation of the species composition of harmful organisms, their numbers and harmfulness is not clear. For example, after surface treatment of the soil the quantity of wire worms decreases by a factor of 2-3. A late sowing schedule significantly decreases the harmfulness of the striped grain flea, but the number and harmfulness of wheat thrips and grain bug do not change for all practical purposes. In connection with the plowing up of large areas of virgin and long-fallow lands some species, as for example the native of virgin soil--the gray grain cutworm--have been transformed into dangerous pests.

Soil that is subject to sweep cultivation creates favorable prerequisites for the mass reproduction of the gray grain cutworm which are neutralized by pre-sowing cultivation and sowing at a relatively late time (a significant quantity of pest pre-cocoons and cocoons perish). Mass outbreaks of this object do not occur, but great abatement also has not been noted, which is partially related to a decrease in the role of natural enemies within a new farming system.

Non-mouldboard cultivation facilitates an increase in the population of the Hessian fly and creates more favorable conditions for the propagation and harmfulness of non-gregarious locusts--Dociostaurus and the white-striped and dark-winged acridians.

The cultivation of spring wheat on large areas as a monocrop has resulted in the accumulation of root rots. However, as a result of the extensive introduction of the soil-conservation farming system the spread of root rots has decreased by a factor of 1.5-2, and harmfulness--by a factor of 2-3.

The species ratios and harmfulness of weeds has changed considerably: there has been a significant increase in the numbers of perennial shoot types--sow-thistle and corn bindweed, and of annual cereal grasses--yellow foxtail, green bristlegrass and wild oats, and a decrease in annual dicotyledons.

All of this has required from specialists a new approach to the development of a comprehensive system for protecting grains and other crops.

In recent years a good tradition has developed--to present a word to the young scientist at the annual meeting of the department. Conference participants heard with great interest the report of V. K. Kireyev, worker at the Gorkiy Experimental Station of VIZR, on the subject, "The Biological Basis for the Comprehensive Protection of Onions from Pests, Diseases and Weeds."

The following people were elected to the buro of the department of plant protection at the annual conference: chairman--N. M. Golyshin, corresponding member of VASKhNIL, academician-secretary of the department; scientific secretary--V. F. Plotnikov, scientific secretary of the department; buro members--M. S. Dunin, VASKhNIL academician and department director of the Moscow division of VIR [All-Union Scientific Research Institute of Plant Growing], P. I. Susidko, VASKhNIL academician and department chairman of VSKhIZO [All-Union Agricultural Correspondence Training Institute], Yu. N. Fadeyev, VASKhNIL academician and department director in VNIIPMBG [Expansion

unknown], S. N. Alimukhamedov, corresponding member of VASKhNIL and director of SANIIZR, N. V. Bondarenko, corresponding member of VASKhNIL and department chairman in LSKhI [Leningrad Agricultural Institute], K. V. Novozhilov, corresponding member of VASKhNIL and director of VIZR, V. F. Peresypkin, corresponding member of VASKhNIL and department chairman in USKhA, N. N. Mel'nikov, corresponding member of the USSR Academy of Sciences and department chairman in VNIIKhSZR [All-Union Scientific Research Institute of Chemicals used for Plant Protection], G. A. Beglyarov, department director of VNIIF [All-Union Scientific Research Institute of Phytopathology], A. S. Volovik, department director of NIICKh [All-Union Scientific Research Institute of Potato Growing], G. S. Gruzdev, department director of TSKhA [Timiryazev Agricultural Academy], T. S. Dubynin, administration director of the USSR Ministry of Agriculture, V. A. Zakharenko, deputy director of TsINAO [Central Institute of Agrochemical Services], N. A. Kabalkina, department director of the State Committee on Variety Testing of the USSR Agricultural Ministry, N. V. Kandybin, department director of VNIISKhM [All-Union Scientific Research Institute of Agricultural Microbiology], V. I. Martynenko, director of the Administration of Plant Protection and deputy chairman of VPNO [All-union scientific production association] of Soyuzsel'khozkhimiya [All-Union Agricultural Chemical Association] of the USSR Agricultural Ministry, V. E. Savzdarg, editor-in-chief of the journal ZASHCHITA RASTENIY, A. I. Smetnik, director of VNITIKiZR [Expansion unknown], S. P. Starostin, deputy director of VIZR, N. A. Filippov, director of VNIIBMZR, A. F. Chenkin, department director of TsINAO and Yu. B. Shurovchenko, director of VNIIZR.

The elected department buro was confirmed by the presidium of VASKhNIL.

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CSO: 1840/1099

## BRIEFS

CONFERENCE ON PLANT IMMUNITY--In June in the Lithuanian NII [Scientific Research Institute] of Farming there was an all-union conference devoted to the theory and practice of utilizing immunity in agricultural crops toward disease. Participating in the conference were leading immunologists from VIZR [All-Union Institute for the Protection of Plants], VIR [All-Union Scientific Research Institute of Plant Growing], the All-Union Breeding-Genetics Institute, VNIISOK [All-Union Scientific Research Institute of Breeding and Seed Farming of Vegetable Crops], the Mironov NII of Breeding and Seed Farming and other scientific-research institutes. Questions related to developing varieties with long-term resistance, to the use of the infection fund for breeding purposes, to the resistance of grain crops to root rots, and to other problems were examined at the conference. [Text] [Moscow ZASHCHITA RASTENIY in Russian No 8, Aug 84 p9][COPYRIGHT: Izdatel'stvo "Kolos", "Zashchita rasteniy", 1984] 8228

CSO: 1840 /1099

## EPIDEMIOLOGY

### PATTERNS OF CONTACT OF SMALL MAMMALS WITH TICK-BORNE ENCEPHALITIS VIRUS IN FOCI OF EASTERN PART OF EAST EUROPEAN PLAIN

Prague ZHURNAL GIGIYENY EPIDEMIOLOGII MIKROBIOLOGII I IMMUNOLOGII in Russian  
Vol 28, No 1, 1984 (manuscript received 7 Jul 82) pp 47-59

NIKITINA, N. A., KUCHERUK, V. V., PCHELKINA, A. A. and KARULIN, B. Ye.,  
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of Medical Sciences

[Abstract] Study of 9256 serums from small animals, including 459 individuals of the species Clethrionomys glareolus and Clethrionomys rutilus tagged in 1964 and 604 individuals of these same species tagged in 1965 [sic] revealed the intensity of contact of the animals with tick-borne encephalitis by years and seasons. Age-related features of contact with the virus of the species and time of appearance, periods of existence and time of disappearance of antibodies in individual animals in nature were discussed. Annual variations of the percent of animals contacting the virus usually did not exceed 2-3 fold with a 5-fold variation in rare cases. Seasonality of appearance of animals with antibodies to the disease corresponded to the period of activity of the basic carrier of tick-borne encephalitis virus, larvae and nymphs of the taiga tick. Parasitization by these ticks began in mid-May and ended in mid-August with a peak at the end of May or June. Antibodies persisted in the rodent for a period ranging from 20-70 days so disappearance of them began in mid-summer. Development of antibodies in young animals occurred not only via transfer of the virus by ticks but also via the mother's milk. Figures 3; references 5:  
4 Russian, 1 Western.

[1581-2791]

## CONTACT OF BIRDS WITH TICK-BORNE ENCEPHALITIS IN THE EAST OF RUSSIAN PLAIN

Prague ZHURNAL GIGIYENY EPIDEMIOLOGII MIKROBIOLOGII I IMMUNOLOGII in Russian  
Vol 28, No 1, 1984 (manuscript received 7 Jul 83) pp 61-68

KORENBERG, E. I., PCHELKINA, A. A. and KOVALEVSKIY, Yu. V., Institute of  
Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical  
Sciences, Moscow

[Abstract] Serological studies of materials gathered in 1960-1964 [sic] provided a general picture of the intensity of contact of birds with tick-borne encephalitis virus in the eastern part of the Russian plain, where relatively few *Ixodes perculatus* P. Sch. larvae and nymphs are found on birds. The study included 706 blood serums from 44 species of the most prevalent bird species in the southern part of Kirov Oblast. It was found that these birds may be infected by tick-borne encephalitis virus but this makes up only a supplemental and insignificant link in circulation of tick-encephalitis virus in nature in this region. References 14 (Russian).

[1581-2791]

## PATTERNS OF CONTACT OF DOMESTIC ANIMALS WITH TICK-BORNE ENCEPHALITIS IN THE EAST OF RUSSIAN PLAIN

Prague ZHURNAL GIGIYENY EPIDEMIOLOGII MIKROBIOLOGII I IMMUNOLOGII in Russian  
Vol 28, No 1, 1984 (manuscript received 7 Jul 82) pp 69-81

KORENBERG, E. I., PCHELKINA, A. A. and SPITSINA, L. N., Institute of  
Epidemiology and Microbiology imeni N. F. Gamaleya, Moscow

[Abstract] Blood serums taken from goats (1641) and from cows (1414) in the south of Kirov Oblast and the Udmurt ASSR (in 1965-1968) were analyzed with use of the hemagglutination reaction, the biological neutralization reaction and the complement fixation reaction. The studies showed a considerable intensity of contact of goats and cows with tick-borne encephalitis virus in the forests of the east of the Russian plain. Hemagglutination inhibition reaction was positive in 27 percent of the goat serums studied and in 17 percent of the cow serums studied. Virus-neutralizing antibodies were found in 29 percent of the goats. Complement fixation reaction was positive in 32 percent of the goat serums and in 20 percent of the cow serums. The relative number of immune animals varied greatly in different parts of the region with a large number of immune animals correlating with a large number of *Ixodes perculatus* ticks. These relationships are discussed in detail. Seasonal variations in immunizations of the animals were found in natural foci of tick encephalitis with the most immune animals being found in summer and spring. Antibodies disappeared in spring in some animals. Immunization of the goats indicated that virus-neutralizing antibodies and antihemagglutinins do not last long in goat blood but may disappear very quickly. Cows appeared to be less sensitive to tick-borne encephalitis virus. The goats and cows grazing in natural foci of tick-borne encephalitis have many contacts with the pathogen in their first year of life. References 19: 16 Russian, 3 Western.

[1581-2791]

PREVALENCE AND FREQUENCY OF GLUCOSE-6-PHOSPHATE DEHYDROGENASE DEFICIENCY IN  
CENTRAL CUBA

Moscow GENETIKA in Russian Vol 20, No 5, May 84  
(manuscript received 20 Jan 83; in final form 15 May 83) pp 864-867

MACHADO KANO, M. Kh. and OPOL'SKIY, A. F., Kiev State University imeni  
T. G. Shevchenko

[Abstract] Epidemiologic studies were conducted on the prevalence and frequency of glucose-6-phosphate dehydrogenase deficiency (GPDD) in the provinces of Villa Clara, Cienfuegos and Santus Spiritus in Central Cuba. Analysis of the blood samples obtained from 3038 male and female subjects (children and adults) showed an incidence of 11.5% for the black males, 7.2% for the mulatto males and 4.1% for whites ('Europeans') males, and corresponding figures of 2.78%, 1.65% and 0.64% for the females. There was no correlation between the incidence of GPDD and any of the age groups. References 8 (Western).

[1575-12172]

FOOD TECHNOLOGY

BRIEFS

CREAM FROM THE SEA--Wednesday 12 Sep--The technology for producing new food products has been developed at the All-Union Scientific Research Institute of Sea Fisheries and Oceanography (VNIRO). Plump, tender and succulent steaks have already been transferred from the large iron skillet to plates. Quite competent tasters from the Institute of Nutrition of the USSR Academy of Sciences, MDR Ministry of the Fish Industry and "gourmet cooks" from VNIRO, armed themselves with knives and forks, are exchanging opinions. "The crust is so golden. Just like on ordinary meat." "And the odor is just like that of a real roastbeef." The dish completely resembled the usual roast in its color, appearance, odor and flavor. But the people who gathered there understood much better very well, after all the steak had not been prepared from ordinary beef.... Fine, small lobsters and zooplankton are the living sinews of the meat. They are entire factors producing substances of the greatest nutritional and medical value. The staff of the laboratory of new protein products of VNIRO is pursuing research, trying to develop new forms enriched with the most valuable supplements on the basis of "marine" natural protein. Thin, coral-colored strands are interwoven, forming intricate figures. The resilient strands retained well the shape given to them. And this property of theirs was used to develop a new product. They became the additional raw material, from which protein-enriched beef was prepared. In general, the formula for preparing it is simple: one takes beef, adds these fibers to it, which are the protein secreted by a small saltwater crayfish. Then the new substance is submitted to special cooking. A product is obtained that differs little from ordinary meat. Yet the scientists maintain that it is even better in flavor and caloric value. Now it is up to the designers. Biologists expect them to develop the blueprints for equipment to produce such beneficial products. [Text] (Moscow MOL'NIKAYA PRAVDA in Russian 15 Sep Br p 21 10,007)

200-1140000

GENETICS

UDC 573.113:576.851.5:576.851.48

CLONING DNA FRAGMENT OF BACILLUS SUBTILIS, CONTAINING GENES FOR LYSINE AND RIBOFLAVIN BIOSYNTHESIS

Moscow GENETIKA in Russian Vol 20, No 7, Jul 84  
(manuscript received 2 Mar 83, final draft received 17 Sep 83) pp 1061-1066

OKUNEV, O. V., SHEVCHENKO, T. N. and MALYUTA, S. S., Institute of Molecular Biology and Genetics, UkrSSR Academy of Sciences, Kiev

[Abstract] Cloning of the Sal I DNA fragment of Bac. subtilis containing genes of lysine biosynthesis included genetic mapping of four mutations and cloning of the chromosome region responsible for lysine synthesis with the aid of plasmid pBR322, capable of replication in E. coli. The cloned fragment contained genes coding lysine biosynthesis enzymes. Location of these genes in Bac. subtilis chromosome was determined. The plasmids pLR33 and PLRB<sup>4</sup>, constructed with the use of pBR322, contain genes of lysine biosynthesis and part of the operon of riboflavin biosynthesis. Figures 3; references 10:  
4 Russian, 6 Western.

[1977-27/1]

UDC 575.1:579.254.26

BACTERIOCIN-GENIC PLASMIDS OF BACILLUS THURINGIENSIS

Moscow GENETIKA in Russian Vol 23, No 7, Jul 84  
(manuscript received 8 Dec 83) pp 1067-1070

BYANCHENKO, N. F. and ALIKHANYAN, S. I., All-Union Scientific Research Institute of Genetics and Selection of Industrial Microorganisms, Moscow

[Abstract] Participation of plasmids of Bac. thuringiensis v.morrisoni and v.darmstadiensis in bacteriocin production and in sporulation regulation was studied with the use of Bac. th.v.thuringiensis, Bac.th.v.dendrolimus, Bac.th.v.galleria and Bac.th.v.morrisoni. Sowing strains of Bac.th.v.morrisoni and v. darmstadiensis on a solid nutrient medium produced a growth of clones at a 1-10 percent frequency with suppression of growth of the clones by the surrounding colonies. It was assumed that the rise of such sensitive colonies is associated with loss of the capacity to produce bacteriocin. Comparative

analysis of plasmid composition of the initial strains and mutants showed that the rise of OspO and The phenotypes correlates with the loss of specific plasmids. Figures 3; references 7: 4 Russian, 3 Western.  
[1577-7191]

UDC 575.1:576.858

#### USE OF PLASMID TO PRODUCE CHOLERA VIBRION DONOR STRAINS

Moscow GENETIKA in Russian Vol 20, No 7, Jul 84  
(manuscript received 29 Aug 83) pp 1071-1079

ZUBKOVA, S. I., IL'YINA, T. S. and SMIRNOV, G. B., All-Union Scientific Research Antiplague Institute "Mikrob" Saratov; Scientific Research Institute of Epidemiology and Microbiology imen. A. F. Gamaleya, USSR Academy of Medical Sciences, Moscow

[Abstract] Production of donor strains of *V. cholerae* and *V. eltor* with the aid of new plasmids which are derivatives of RPl (RPlts and pRPl9.6) and IncT-plasmids of pNS10 which are derivatives of Rts1, carrying transposon Tn10 was studied and described. Properties of the donors were discussed and the sequence of some chromosomal markers was determined. Introduction of conjugative R-plasmids into cholera vibrio chromosome produced two types of donors with the first type being analogous to Htr-donors of *E. coli* that realize directional transfer of chromosomal genes but do not transfer into a cell of the cholera vibrio plasmid determinants and the second acting like F+ - or M+ -donors which were probably transferred with chromosome markers of the gene of the plasmids. Differences in properties of these donors were caused by differences in mechanical integration of plasmids and the chromosome.

References 17: 8 Russian, 9 Western.  
[1577-7191]

UDC 575.24:576.851.51

#### INITIAL GENETIC ANALYSIS OF RIBOFLAVIN BIOSYNTHESIS IN BACILLUS LICHENIFORMIS

Moscow GENETIKA in Russian Vol 20, No 7, Jul 84  
(manuscript received 27 Dec 82, final draft received 25 Nov 83) pp 1108-1116

PANINA, L. I. and RAPINOVICH, P. M., All-Union Scientific Research Institute of Genetics and breeding of Industrial Microorganisms, Moscow

[Abstract] Isolation and study of 7 riboflavin-dependent mutants, in which the structural genes of riboflavinogenesis were damaged, are described and discussed. All rft mutations were found in 1 linkage group, situated on a chromosome of bac. licheniformis near lym. markers. Mutation rft 313 leads to accumulation in the culture fluid of a substance identified as 6,7-dimethyl-2-ribotyrylbenzoic acid (SRB). These mutations evidently damage the gene of

riboflavin synthetase. Complementation analysis of mutation rib 207 indicated that this mutation damages the gene analogous to gene rib G of *Bac. subtilis*. Data presented indicated the affinity of the genetic systems of both forms of bacteria and the possibility of studying riboflavin genesis in bacillae with the use of plasmids which ensure interspecies exchange of genetic material. References 14: 8 Russian, 6 Western.

[1577-2791]

UDC 631.95:632.95:575.11:574.43

#### APPEARANCE OF PLANTS WITH EAR MORPHOSIS IN BARLEY PLANTINGS AFTER TREATING THEM WITH HERBICIDE 2,4-D

Moscow GENETIKA in Russian Vol 20, No 7, Jul 84.  
(manuscript received 3 Jun 83, final draft received 15 Sep 83) pp 1182-1189

KIRILLOVA, G. A., NEMTSOVA, N. S. and FADEYEVA, T. S., Chair of Genetics and Selection, Leningrad State University imeni A. A. Zhdanov

[Abstract] Comparison of plants with ear morphoses and unchanged plants, taken from barley sowings treated with 2,4-D is discussed in relation to the effect of such treatment on productivity and varietal qualities of the barley. The number of ear morphoses depended upon the herbicide dosage, the phase of development of the plant, weather conditions at time of treatment of the sowings and growing conditions. Type of morphoses and number of morphoses were related to the genotype of the variety. There were some sensitive varieties with many morphoses and some resistant varieties with few morphoses. Analysis of the main ear of 3 rye varieties showed that ears with morphoses were shorter and fewer in all varieties than were those in morphologically unchanged ears with the degree of difference depending upon the variety. Productivity of plants with ear morphoses was higher than that of plants without morphoses because of greater bushiness of plants with ear morphoses. Importance of the rise of ear morphoses due to a regularly acting factor for changing the composition of varietal populations is discussed. Figures 4; references 20: 17 Russian, 3 Western.

[1577-2791]

UDC 677.111

#### CHARACTERISTICS OF CH<sup>-</sup> AMELIA CARRIERES IN CHILDREN OF STUDENT POPULATION IN KOSTROMA

Moscow GENETIKA in Russian Vol 20, No 7, Jul 84  
(manuscript received 20 Jul 83) pp 1210-1212

KRASNOPOLO'SKAYA, K. D. and BYALIK, M. A., Institute of Medical Genetics, USSR Academy of Medical Sciences, Moscow

[Abstract] Sampling of 952 Kostroma school children (420 girls and 532 boys ranging in age from 7-15 years) was studied to assess the frequency of genetic

heterogeneity of erythrocytic glucose-6-phosphate dehydrogenase (G-6-PD) in a population having had no previous contact with malaria pathogens. The Gd<sup>-</sup> alleles spectrum of this group was compared with that of an analogous sampling of Azerbaijanians. Gd<sup>-</sup> alleles found in 2 hemizygotes belong to class III according to World Health Organization classification. A mutant form of G-6-PD isolated from one of the hemizygotic individuals and analyzed according to World Health Organization procedures differed from all others described in the literature. This allele was named "Kostroma". Figure 1; references 15: 10 Russian, 5 Western.  
[1577-2791]

UDC 577.151

#### MARITAL SELECTION IN MODERN POPULATION

Moscow GENETIKA in Russian Vol 20, No 7, Jul 84  
(manuscript received 25 Jul 83) pp 1224-1229

BOCHKOV, N. P., NIKOLAYEVA, I. V., TIKHOPOY, M. V., LUNCA, I. N. and PRUSAKOV, V. M., Institute of Medical Genetics, USSR Academy of Medical Sciences, Moscow

[Abstract] A sample including 13,746 Angarsk residents, ranging in age from 21 up to 60 years, was used to study the marital pattern according to nationality. The population studied included Russians (86.37 percent), Ukrainians, Buryats, Belorussians, Tatars and other nationalities, (the latter making up less than 1 percent of the total population). Study of the distances between birthplaces of spouses showed a predominance of marriages involving a husband and wife from different oblasts and pointed out the high rate of migrations occurring in growth of a new city. A qualitative approach for assessing marital patterns according to national origins, based on interval assessment and determination of the  $\chi^2$  criterion showed that marital selection on the basis of national origins occurred in all nationalities studied. References 6 (Russian)  
[1577-2771]

UDC 577.1:577.5

#### AGROBACTERIUM PLASMIDS AS POTENTIAL VECTORS FOR GENETIC ENGINEERING IN HIGHER PLANTS

Moscow GENETIKA in Russian Vol 20, No 5, May 84  
(manuscript received 1 Jul 81; in final form 17 Oct 83) pp 207-211

ANDRIANOV, V. M., Institute of Molecular Genetics, USSR Academy of Sciences, Moscow

[Abstract] A review of essentially Western literature is presented on the use of Ti plasmids (tumor inducing) as a vehicle for research on genetic engineering in higher plants, including a discussion of the characteristics and properties of the various plasmids. Particular attention is accorded to tumor induction

in dicotyledonous plants by Agrobacterium tumefaciens, which is attributable to the Ti plasmids. It has been determined that tumorigenesis involves a transfer of a fragment of the Ti plasmid genome into the plant genome, and that such a Ti plasmid DNA fragment can serve as a vehicle for introducing exogenous genes into the plant genome. It remains to be determined which of the Agrobacterium plasmids are most efficient in such processes and, therefore, the most promising vehicles for the modification of plants by the techniques of genetic engineering. Figures 3; references 128: 2 Russian, 1P6 Western, (1573-12172)

UDC 575.113

#### STRUCTURAL ANALYSIS OF Alu-CONTAINING DNA FRAGMENT INTERRUPTED AMONG HUMAN CHROMOSOMES

Moscow GENETIKA in Russian Vol 20, No 5, May 84  
(manuscript received 28 Nov 83) pp 738-745

SAYTSIN, I. E., GINNIFIS, V. M., SHAPIRO, Yu. A., YUPOV, Yu. S. and YAKOVLEV, A. S., All-Union Scientific Center for Mental Health, USSR Academy of Medical Sciences, Moscow

[Abstract] Analytical studies of human DNA derived from lymphocytes revealed two terminal subfragments (ca. 500 bp, total) of DNA alone. The DNA alone (sequence pHS35) hybridized with dispersed regions on all chromosomes with the exception of the Y chromosome and the pericentric region of the X heterochromatin. Both DNA fragments were determined to contain Alu repeats, the primary structure of which differed partially from the Alu repeats of the MuIR series in the human genome, and which indicates a general degree of heterogeneity of ca. 40% rather than the 13% initially established for the MuIR series. Evaluation of the degree of heterogeneity of this dispersed family of sequences suggests that some minor sub-families of the Alu sequence can serve as markers of molecular polymorphism in human chromosomes. Figures 4; references 41: 3 Russian, 23 Western.  
(1573-12172)

UDC 575.47(03.71)

#### HETEROGENEITY OF HYTRA POPULATION IN TERMS OF HEAT SENSITIVITY

Moscow GENETIKA in Russian Vol 20, No 5, May 84  
(manuscript received 17 May 83) pp 800-807

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[Abstract] A total of 15 clones of *hytra* (hydra clivosa) were cultivated for 24 hours under optimal growth conditions, varying heat sensitivity (heat sensitivity, 0% heat sensitivity (91%), 10% and 100% survival) the clones can be differentiated by normality,

equivalent stable and unstable groups. For the stable group, statistical analysis has shown the genetic component of the general phenotypic dispersion of tolerance to be of prime importance, while in the unstable group only the (genotype x generation) variance was statistically significant. In the latter case, a negative correlation prevailed between the degree of heat tolerance of the parental clones and that of subsequent generations. Analysis of the relationship between theoretically expected selection results ( $R_t$ ) and experimental results ( $R_e$ ) showed that for the stable group the values were quite similar and yielded linear  $R_e$  vs.  $R_t$  plots, while considerable deviation was obtained with the unstable group. These observations indicate that for the stable group, even if the selection differential is low, artificial selection is possible for heat tolerance, while for the unstable group it is virtually impossible. Figures 2; references 16: 15 Russian, 3 Western.  
[1575-1217]

IDC 575.591

#### PREVALENCE OF HEREDITARY GASTROINTESTINAL ADENOMATOSIS IN MOSCOW

Moscow GENETIKA in Russian Vol 20, No 3, May 84  
(manuscript received 20 Jul 83) pp 237-241

TATISHVILI, T. G., NIKITIN, A. M. and AL'TSHLER, B. A., Institute of Medical Genetics, USSR Academy of Medical Sciences, Moscow

[Abstract] In order to ascertain the prevalence of hereditary gastrointestinal adenomatosis in Moscow, a survey was conducted on patients with pre- and neoplastic conditions of the large intestine for the period 1982-1983, in conjunction with retrospective case studies for the period 1974-1981. Statistical analysis of the available data yielded an incidence of approximately 1:48,000 for the Moscow population for the time span in question. This information will constitute the baseline for further studies to determine the population frequency of carriers, the gene frequency, and the rate of mutation, and in the planning of preventive and therapeutic measures for hereditary gastrointestinal adenomatosis. References 16: 15 Russian, 1 Western.  
[1575-1217]

## LASER EFFECTS

UDC: 617-001.4-085.849.19-036.8:616-003.93-091

### EFFECT OF LASERS ON POSTINJURY TISSUE VASCULARIZATION PROCESS

Moscow ARKHIV PATOLOGII in Russian Vol 45, No 8, 1983 (manuscript received 10 Dec 82) pp 72-76

[Article by V. S. Barkovskiy (Moscow), Central Scientific Research Institute of Stomatology, USSR Ministry of Health]

[Text] Key words: wounds, laser radiation, stimulation of healing.

Development of the first lasers in the early 1960's opened up new possibilities of using energy of light in biology and medicine. At present, lasers are actively used as part of the armamentarium of public health practice. The properties of laser beams are already used in ophthalmology (in cases of separation of retina, diabetic retinopathy, etc.), surgery, stomatology, cosmetology, etc.

Wise use of lasers for therapeutic purposes is possible only on the basis of comprehensive theoretical and experimental analysis of the effects of laser radiation on biological processes in a living organism (B. V. Ognev et al.; V. S. Barkovskiy et al.; A. A. Prokhonchukov and M. T. Aleksandrov; Wolbarsht; Kiss et al.; Kovasch et al.; Wiedemann).

The results of the experimental study of Mester et al., who discovered that laser beams have a stimulating effect on wound healing, opened up a new area of clinical application of lasers.

An effort was undertaken here to determine the nature of effect of laser radiation on one of the most important stages of wound healing, the process of revascularization. Without stressing attention on the distinctions of regenerative processes in individual microvessels and stages of regeneration, which have been repeatedly described in the literature (Clark; Aloisi et al.; Folke; Aloisi and Schiaffino), we tried to determine the degree of efficacy of laser radiation on the process of revascularization of tissue after it has been injured, i.e., restoration of microcirculatory pathways, using vital microscopy and morphometric analysis.

The subcutaneous tissue from a rabbit ear, which was imbedded in a clear chamber (Figure 1) according to the Clark method, was the object of our study. The transparent chambers, which we

modified for the study of regenerative processes, were made of titanium and plastic that freely transmitted laser radiation. The experimental animals (10 rabbits) were divided into two equal groups: control (regeneration without lasers) and experimental (regeneration with laser radiation).



Figure 1. Transparent chamber implanted in rabbit ear by Clark method

After implanting the clear chamber on the principle of containment of nondeformed (not stretched or compressed) section of tissue (10 mm in diameter) together with blood vessels between two windows (removable and permanent), the animals were kept for 5-7 days without any treatment until there was restoration of normal blood flow in the microcirculatory bed of the region under study, after which further manipulations were performed.

After opening one of the windows [portholes] in the chamber, a segment of tissue 4 mm in diameter was excised. Then, in the place of the removable window, we inserted one with a special, transparent "regenerative table," the diameter of which was the same as the diameter of the wound defect (4 mm). The new window was installed in such a way as to have a gap 100  $\mu$ m wide between its "regenerative table" and permanent window, into which connective tissue with blood vessels will subsequently grow.

We used a 5 mW helium-neon (gas) laser for irradiation. The laser beam was so projected as to have its diameter equal 10 mm, i.e., the entire area of tissue was exposed. Irradiation energy was

I.J. The tissue contained in the transparent chamber was exposed to lasers daily, from the moment it was traumatized to complete regeneration of the injured zone and definitive restoration of microcirculation in it.

Growth of microvessels and restoration of microcirculation of blood were recorded by means of microphotography using an MKU-2 microdevice. Observations were pursued daily, until there was complete closure of the wound defect. The morphometric data were submitted to statistical processing.

A comparative analysis of our results showed that there were several features in common in the progress of regenerative processes in the microcirculatory system of injured tissue in control and experimental animals. Blood capillaries from the nondeformed connective tissue surrounding the wound serve as the source of de novo production of microvessels. They originate endothelial processes which, as they increase in length, become subsequently channeled and differentiated, forming the microcirculatory bed of the regenerative zone of tissue,

The main distinctive feature of revascularization processes in control and irradiated animals is the timing of restoration of microvessels. Interestingly, laser radiation has no appreciable effect on the time of appearance of the first microvessels in the wound: capillaries were first observed in the marginal region of regenerated tissue within 8-10 days after traumatization of tissue in both groups of animals. At the same time, at subsequent stages of the experiment, particularly by the 16th day, there were differences in rate of wound vascularization in control and irradiated animals. Thus, by the 16th experimental day, microvessels occupied more than half (and in one case two-thirds) of the area of the "regenerative table" (taken as 100%) in experimental animals and only one-fourth in the controls, constituting 53.8±7.1 and 21.6±4.2%, respectively.

In addition to change in rate of vascularization of regenerative tissue with exposure to lasers, differences were demonstrable in quantitative proportion of different elements of the forming microcirculatory system in control and experimental groups at different stages of the experiment. These differences pertain mainly to blood capillaries, and they were the most marked by the 16th day of wound regeneration (Figure 2). As for afferent and efferent elements of arteriolarization, no significant difference was noted in development of arteriolar and venular microvessels between control and experimental animals in the zone of regeneration (Figure 3).

The less marked differences in number of arteriolar and venular elements, as compared to capillaries, can be attributed to the greater proliferative capacity of capillaries at this stage of the experiment. However, the fact that this situation persists throughout the observation period warrants the assumption that lasers cause predominantly acceleration of growth of microvessels having no effect (or almost no effect) on the rate of their differentiation.

Simultaneous completion of revascularization of the regenerative granulation tissue in the two groups of animals is a consequence of the joint action of

microvessels under the influence of laser beams: in most (4 out of 5) irradiated animals this process ends by the 20th-22d experimental day, whereas in controls this happened only by the 25th-27th day.



Figure 2.  
Vascularization of capillaries in  
microcirculatory system by 16th day of  
experiment; magnification 90×  
a) control animals  
b) irradiated animals  
Biomicrophotograph, magnification  
90×

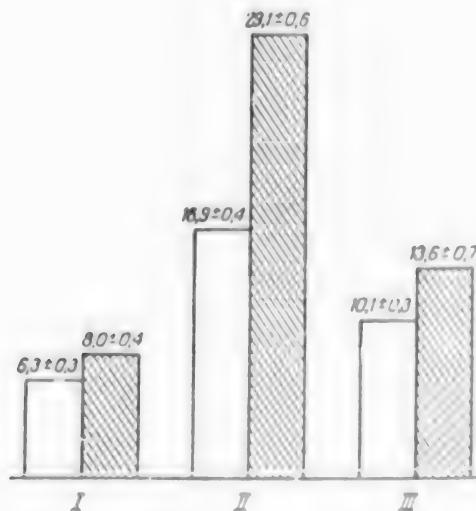


Figure 3.  
Proportion of different micro-  
circulatory elements in regenera-  
tive zone of control (white bars)  
and irradiated (crosshatched bars)  
animals by 16th day of experiment  
I) arteriolar elements  
II) capillary elements  
III) venular elements

To date, there is no single theory interpreting the mechanisms of action of laser beams, which stimulate the process of vascularization of a wound surface. The opinion is held that the observed phenomenon could be due to activation of blood vessels injured at the time of the operation under the effect of laser radiation, increase in phagocytic activity of macrophages which, causing fibrinolysis in blood clots, thereby alleviate the process of advancement of growing blood capillaries (Kovasch et al.). At the same time, is conceded by these authors, the principal questions about the mechanisms of effect of laser radiation on biological processes have only been formulated, rather than answered.

Evidently, the efficacy of irradiating a wound surface with helium-neon lasers could be determined by the change in energy potential of structural components of microvessels and adjacent tissues, as well as metabolic changes and

transformation of intertissular interactions, which play an important part in regenerative processes (A. N. Studitskiy). The intervention of laser beams in intimate mechanisms of cell metabolism and tissular interactions could be mediated via regulatory neurohumoral systems. Excitation of the latter's effectors could also be provoked by a change in heat balance in tissues exposed to lasers (M. K. Krasnov).

The results of this investigation confirmed the thesis of M. Ye. Zel'tser et al. concerning increase in speed of regeneration of the microcirculatory system with exposure of tissue to laser radiation.

In addition, the results of this work constitute a practical confirmation of the data of V. V. Kupriyanov (1969, 1972) concerning maximum regenerative capabilities of blood capillaries and their leading role in the revascularization process, as sources of formation of all elements of the microcirculatory system.

#### Conclusion

Morphometric analysis yielded statistically reliable data about the change in rate of vascularization of regenerative tissue and proportion of microcirculatory elements when a wound is exposed to lasers during healing. Vital microscopy made it possible to establish the physiological nature of revascularization of regenerative tissue under the influence of laser radiation and single out some of the distinctions in its progress.

Elaboration of theory of effects of laser radiation on the process of vascularization of regenerative tissue and preparation of validated clinical recommendations are becoming an urgent need, in the light of the obtained data concerning the stimulating effect of laser beams on processes of restoration of microcirculation in injured tissues.

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CS(1): 6144/1011

UDC 619.1/.4-082

## CERTAIN CLINICAL AND ORGANIZATIONAL FEATURES IN WORK OF THERAPY

Moscow KLINICHESKAYA MEDITSINA in Russian No 7, Jul 84 (manuscript received 19 Jan 84) pp 138-143

[Article by Prof. L.A. Leshchinskiy, head of the hospital therapy department No 1, Izhevskiy medical institute, and A.S. Dimov]

[Text] The development of medicine in every period of time undoubtedly imposes its peculiarities on the character of the practice of medicine. Of obvious modernness are the demands of I.A. Kassirskiy [6] and A.F. Bilibin [1, 3] on the necessity of doctors themselves, first of all, studying general trends in the physicians profession. However, the number of clinicians' works on this subject is not great [2, 4, 5, 14, 15, 17-22].

What do certain features of the modern stage of medical practice consist in—what are its possible advantages and faults having to do with the clinical and organizational uniqueness of modern medicine?

We have set several tasks in this work: a) to ascertain the number of diseases (on the average) that one patient has and the connection of this polypathology (polymorbidity) value with the patient's age; b) to find out how many physicians are actually taking part in the treatment-diagnosis process of one hospitalized patient, to what degree the management of one patient under in-patient conditions is a collective medical act, who and to what extent participates in this treatment-diagnosis medical group, how is the succession of actions and ideas carried out within the limits of this essentially apart from the patient and prolonged (for the length of the hospitalization) medical consultation; c) to ascertain how widespread polymedication (polypragmasy) is at the present time.

With this object we conducted a retrospective analysis of 484 case histories of diseases of the internal organs found in a 420-bed clinical hospital (which has several specialized and general therapeutic departments) that serves the workers of a large association and the population of the city. On the registration of casuistical units, only those active diseases of internal organs that were "current" during the hospitalization period and that required treatment measures in the appropriate department were stated. Therefore chronic diseases of internal organs were not considered which manifested themselves immediately or at the time of the study but were apart from the acute condition, or that were ascertained in consultations with specialists in narrow specialties but not noted on the title page of the case history in the final diagnosis.

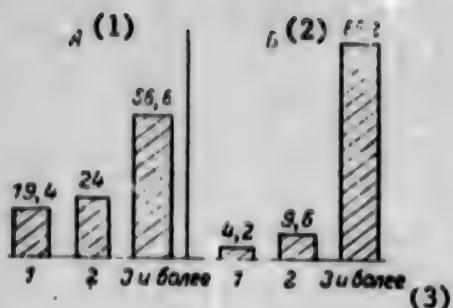
In the course of studying the case histories, the number of physicians was established according to the notes: ward physicians, consultant-therapists (department heads, faculty colleagues), physicians in narrow specialties (oculists, otorhinolaryngologists, neuropathologists, etc.), other physician-diagnosticians (x-ray specialists, radiologists, endoscopy specialists, functionalists, etc.), admitting and duty physicians with their corresponding notes in the case history, and also physicians in other specialties (physical therapists, specialists in exercise therapy, stomatologists, etc.). In this only the number of physicians was considered, and not the frequency of their contacts with the patient.

The results of the studies showed that the average hospitalization lasted 25.2 days. During this time each patient was subject to treatment for 3.96 diseases on the average. A clear connection was noted between this value and age; there was an increase in average number of diseases, depending on age group, from 2.5 to 4.79 (table 1).

Table 1. Number of active diseases (acute phase) established simultaneously in patients with various diseases of the internal organs.

Diseased system	Number of diseases by patient age, years				Total diseases	No. of patients	No. of diseases per patient
	to 20	21-40	41-60	over 60			
Blood circulation	9	88	421	478	996	219	4.54
Rheumatism and collagenosis	11	87	76	-	174	42	4.41
Respiratory organs	17	79	162	67	325	100	3.25
Digestive organs	2	25	160	14	201	49	4.1
Urinary tract organs	8	46	34	7	95	25	3.8
Endocrine system	-	8	33	-	30	9	3.3
Other	23	48	24	-	95	40	2.3
Total	70	381	899	566	1916	484	3.96
Total patients	28	126	212	118	484		
No. of diseases per patient	2.5	3.02	4.24	4.79	3.96		

It can be seen from table 1 that an indicator like the number of concurrent diseases is dependent on age and has little connection with the character of the disease. Hence, the relatively higher value for the group of patients with circulatory system diseases is tied to the relatively greater number of older patients here, and among diseases of endocrine organs and others the low value correlates with the relatively more youthful composition of the patient group. It should be noted that patients with 1 active disease were only 7 percent, those with 2 diseases were 14.2 percent, and with 3 diseases and more--78.8 percent. These values are more revealing when broken down according to age groups under and over 40 years (see graph). These data correspond to those obtained by other authors [10, 12, 16-19].



Graph. Number of patients (percent) with simultaneously active diseases.  
A - under 40, B - over 40. On the horizontal axis - number of diseases.

Key:

1. A
2. B
3. three and more

Our studies show (table 2) that during the patient's hospital stay (25.2 days average), he was attended and treated first-hand by an average of 9.39 physicians.

Table 2. Number of physicians attending and treating patients.

Age, years	No. of patients	Average bed-days	Number of physicians						
			Total	Ward	Consultant-therapists	Consultant-non-therapists	Diagnostic departments	Duty and admitting	Other
Under 20	20	15.3	203	33	8	46	69	27	20
21-40	126	20.4	1121	195	56	197	363	159	151
41-60	212	23.5	2014	313	145	354	581	374	247
Over 60	118	35.1	1209	198	40	106	436	396	33
Total	484	25.2	4547	739	249	703	1449	956	451
No. of physicians per patient			9.39	1.52	0.51	1.45	2.99	1.97	0.93

The number of physicians increases in the older patient age groups. It should be noted that "in-person" joint examinations of the patient and consultations, (with the exception of consultations of senior specialists and therapists by ward physicians) were very rarely conducted; in the majority of cases unity of tactics and the continuity of medical thought were realized by means of notes in the case histories.

During hospitalization each patient took an average of 8.58 various drugs per os (4.73 at one time), and 6.45 parenterally. Here the patients were given an

average of 3.28 injections daily. In this way each patient was given an average of 11.18 various medications simultaneously. Monopragmasy was almost absent in therapy by orally administered means (1.4 percent of the patients), and was very rare when injections were used (4.5 percent). If oligopragmasy is examined conditionally as the taking of from 1 to 4 types of tablet form (or injectable) medications, then it occurred in 20.7 percent of patients taking medication orally and in 32.5 percent of those taking it by injection.

Mono- and oligopragmasy with orally administered therapy occurred in 67 percent of the patients in the under 20 age group, and in only 1.7 percent of those in the over 60 group (polypragmasy occurred among the remaining older patients). If one also takes into consideration that many of the orally administered medications were combined preparations that were often taken from 3 to 6 times in 24 hours (4 times on the average), frequently 2 or more tablets at a time, then there is a substantial drug load on 1 patient in most cases, especially in the older groups.

These data reveal a number of contradictions and bring up an entire range of questions on today's clinical care of internal diseases. We know that in the first half of the 20th century the practice of medicine was dominated by the "one patient-one disease-one physician-one treatment" concept. The reality of medicine in the second half of the century is apparently another formula: "one patient-polypathology (polymorbidity)-polyiatry (many physicians)-polypragmasy". In connection with this it is possible to review one of the diagnostic postulates of the past--the endeavor to construct a mononosological diagnosis from all the variety of symptoms and syndromes. Hence, we specially studied 600 cases of mistaken diagnosis in polyclinics (verification of the diagnosis was conducted in a clinic). It was established that a mononosological diagnosis (ascertaining only one disease in the patient), toward which the physician frequently strived, turned out to be incorrect in 182 cases (30.3 percent); each patient actually had 2 or more diseases. The opposite situation was noted almost 5 times less frequently, in only 38 cases (6.3 percent). In 316 cases (52.6 percent) the presence of polypathology (polymorbidity) was confirmed by the final diagnosis, and in only 65 cases (10.8 percent) did the patient's monopathology correspond to actuality.

From these data ensues the necessity of the scientific and clinical study of the simultaneous course of a combination of 2-4 diseases, especially the ones that are most common in practice, and the study of the features of their clinical care and of the therapeutic tactics used for them. One must remember that the isolated classic forms of diseases are most often only an educational, academic phenomenon and a concept that is very rarely encountered in real clinical practice (according to our data in only 7 percent of cases). Isolated monopathology occurs in hospitals, according to the data of various authors of the 1960s and 70s, in only 13.5-32 percent of cases [7, 14, 15, 19].

The idea of hospitalizing a patient in one or another specialized department is very relative since, as a rule, only one of the patient's three to five diseases correspond to this specialty and the rest are outside of it. In practice it is far from always possible to ascertain the primary disease, the criteria of which are very relative and conditional and in many cases determined arbitrarily

(sometimes also with the tactical object of hospitalization specifically in a given department according to its specialty). Besides, in the course of observation, primary and secondary diseases often change places. Neglect of secondary "out-of-specialty" diseases arises from this in the treatment plan.

The problem of "mixed diseases" in the modern multi-profile specialized therapeutic hospital is linked to a definite range of diagnostic errors. In our study of the causes of diagnostic errors, the one-sidedness and narrowness of the preparation of the therapist, who had specialized in the framework of a single therapeutic discipline: cardiology, gastroenterology, etc., was one of the leading causes (out of an entire complex of objective and subjective causes of error) in 13.4 percent of cases. The differentiation of disciplines, specialization of physicians, and the "narrowing" and "deepening" of specialists is a necessary and unavoidable phenomenon. At the same time, one-sidedness is always bad and must be prevented. One of the solutions here (and not the only one) might be training physicians not only in the direction of a specialty, but also toward a general therapeutic integration (systematic analysis of patients of "various profiles" at general clinical and hospital conferences, a system of periodically transferring physicians from departments of one specialty to others, and training in specialized courses in other therapeutic disciplines, etc.).

The problem of polyiatry is also many-sided in its consequences. An increase in the number of physicians, including ward physicians, attending one patient leads to a large psychological burden and sometimes definite discomfort, to significant losses of information in connection with disruption in continuity, and sometimes to a multiplicity of approaches to treatment, repeated change, and to a profusion of drugs being taken. Under these conditions particularly the role of a correctly and adequately conducted case history grows. Face to face consultations are rare. A group of 9 or 10 physicians managing one patient in the hospital may rely only on the case history, the basis of continuity in their consultation away from the patient. At the same time the current method of conducting a case history (or out-patient chart) as a medical document about the patient does not correspond to the task and the peculiarities of the time. With the ever increasing number of diagnostic indicators, especially laboratory and instrument readings (according to the data of V.V. Men'shikov [9], one patient with a disease of the internal organs undergoes up to 91 tests during hospitalization), even before the patient's release the case history often is turned into a dead archive, a not always orderly storehouse or depository of signs, indications, symptoms, facts, etc., without any attempt at summarization or interpretation. The statements of M.V. Chernorutskiy and coauthors [13], A.V. Smol'yannikov [11], and B.P. Kushelevskiy [8] are fair; in a case history there is much information about the patient but it is impossible to determine "the physician's thoughts about the patient" from it. It is true, preliminary, concurrent, and conclusive diagnostic conclusions in the case history arise, as it were, all of a sudden, like an understood result, a direct continuation of the complex of symptoms described and the laboratory and instrument data. In this way there exists a gap between the initial data (the bare, stated facts) and the result, the diagnosis; that is, what may be the most valuable part of medicine in diagnostics, the thought and logic, is not represented or stated. The case history as a tool of the physician (in a diagnostic aspect) is fulfilling only a part of its function, reflecting in agreement with the Leninist theory

of knowledge (and the act of diagnosis is a particular case of knowledge), only the "sensing", "contemplative" stage of knowledge of a disease and underestimating or even ignoring the second, abstract-logical stage of the diagnostic process. At the present time it is necessary to have a documented reflection in the case history of the medical thought process (in the form of medical reasoning, successive conclusions, the grounds for the diagnosis), that is, data on the interpretation, argumentation, system of proofs and grounds for the diagnosis as well as the treatment plan.

A short statement of the progress of clinical thinking, our experience shows, makes the job significantly easier for subsequent physicians, other specialists, and consultants, who often have to repeat the entire reasoning process from symptoms to diagnosis all over again, from zero as it were. Such a statement facilitates continuity of thought; it also facilitates the observation of errors in preliminary diagnostic and therapeutic working hypotheses. It is also significant in terms of saving time and reducing the number of repeated investigations and reinvestigations.

The special study of the causes of diagnostic errors that we conducted from clinical-gnosiological positions showed that diagnostic errors linked to defects in investigation and information about the patient occur in 74 percent of cases. At the same time in virtually every case mistakes arose in connection with improper application of the methods, laws, and rules of formal and dialectical logic on the part of physicians. Hence, with respect to all cases of formal-logical error, errors linked to application of the method of analogy comprised 21.3 percent, induction method—23.1 percent, and deduction method—15.2 percent. From this ensues the necessity of increasing the attention paid to the abstract-logical part of the diagnostic process and its reflection in the case history and to the introduction of short diagnostic reasonings (10-15 lines in our experience) into the case history, reflecting the thoughts of the physician in establishing a diagnosis in the hospital and subsequently (in case there are substantial changes in it). It is obvious that the training of physicians in clinical thinking as generally the correct realization of the abstract level in diagnostics—the special training of physicians in the laws and principles of logic applicable to medicine is one of the chief resources for improving diagnostics and the practice of medicine as a whole.

In this way the collective management of patients in a hospital is a positive factor. However, when the previous method of conducting a case history and the absence of sufficient continuity are retained as well as inadequate responsibility and imperfect thought processes on the part of the treating (wgrd) physician, polyiatry can play a negative role.

As far as polypragmasy, it cannot be only an unconditional evil of modern clinical care in all cases. It is not only a "scourge" and "bad luck" of modern clinical care, but in some measure an unavoidable sign of the times that has a definite basis, since it is the consequence of a number of complicated processes, the action of which is impossible to "note". Hence, polypragmasy, to a certain extent, is a consequence of polymorbidity; in the second place it is linked to the successes of science and the accurate definition of details of the pathogenesis of diseases and to the intended action of various medicinal substances on definite elements of pathogenesis. Finally, it is often based on the modern

physician striving to maximally intensify therapy, particularly under urgent conditions, the proportion of which is increasing in the practice of therapy; the shortage of time in these cases does not allow medicines to be applied consecutively.

It is still urgently necessary to regulate the number of medications given simultaneously. Our experience shows that a number of subjective factors resulting not even in poly-, but megapragsasy and causing substantial danger to the patient have become quite widespread in modern practice. A significant part of polypragmatic accumulation is the direct result of polyiatry and an uncritical attitude on the part of the participants in the physicians' group toward drug therapy. The virtuous and humane principle of each physician (including those in narrow specialties as well)--ut aliquid fiat (in order to accomplish something, prescribe) is turned into its opposite. A new physician prescribes "his" new additional drugs without cancelling the previous ones (and among physicians and patients both the impression is at times widespread that if a new physician or consultant does not prescribe additional medications then the consultation or examination was generally in vain, ineffective, etc.). We certainly know that drug therapy is very often unjustifiably prolonged, including in those cases where backup therapy is not at all necessary, not rational. In the battle against unjustified, irrational polypragmasy the control of department heads and clinical directors should be improved; specific examples of such polymedication should be the topic of special collective medical discussion and joint analysis.

At the same time, rational drug combinations (complexes) from three or four substances should be better studied in the context of experimental and clinical pharmacology, since classical pharmacological study of a single preparation is today essentially the study of an experimental-laboratory phenomenon that is almost never reproduced in that way in modern clinical care. Also urgently necessary for the modern internal clinic is a sharp increase in the attention paid to the use of the diverse and very effective arsenal of non-drug means of treatment, particularly the wide development and institution in the practice of treatment and rehabilitation of improvised systems of kinesiotherapy for various internal diseases.

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CHANGE IN REGULATORY CHARACTERISTICS OF GLYCOLYSIS IN ERYTHROCYTES DURING  
STORAGE OF DONOR BLOOD

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 30, No 3, May-Jun 84  
(manuscript received 12 May 83) pp 109-112

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[Abstract] Determination of factors leading to disruption of the functional value of erythrocytes in stored donor blood is an important task. The purpose of this work was to determine changes in the characteristics of glycolysis in erythrocytes in the process of storage of conserved donor blood. Donor blood was placed in 250 ml flasks containing 50 ml of glucose-citrate hemoconservant 7v. The blood was stored at 4°C and periodically tested to determine content of ATP in the erythrocytes and total erythrocyte content. It was found that in addition to significant variation in the parameters measured from donor to donor there was significant individual differences in the kinetics of changes in the metabolism during storage. The qualitative behavior, however, was the same in all cases. The concentration of ATP in the erythrocytes continuously dropped during storage, the rate of this process differing greatly from donor to donor. During the first 2 to 4 days of storage the physiological rate of consumption of glucose in the erythrocytes increases, reaching perhaps double the value in the first day of storage, then the physiological glucose consumption rate begins to decrease. The results demonstrate significant changes in energy metabolism of erythrocytes in the process of storage. It is suggested that special selection of pretested donors could yield blood capable of storage over longer times than average donor blood. Figures 4; references 19: 5 Russian, 14 Western.

[1539-6508]

MICROBIOLOGY

TRANSFER OF RESISTANCE TO CEPHAMANDOL AND CEPHOTAXIM FROM HOSPITAL STRAINS  
OF KLEBSIELLA AND SERRATIA

Prague ZHURNAL GIGIYENY EPIDEMIOLOGII MIKROBIOLOGII I IMMUNOLOGII in Russian  
Vol 28, No 1, 1984 (manuscript received 21 Jun 83) pp 115-117

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[Abstract] Diversity of resistance of hospital strains of Klebsiella and Serratia to new cephalosporin antibiotics was studied by conjugation experiments. It was found that resistance to classical and new cephalosporins was always transferred jointly and was not associated with transferred resistance to gentamycin or trimetoprim. It was found that beta-lactamases, transferring to recipient strains of *E. coli* and *P. mirabilis*, are responsible for resistance to cephalexin and cephalexim. References: 5 Western.  
[1581-2791]

MOLECULAR BIOLOGY

UDC: 577.175.8:061.3(47+57)"1983"

JUNE 1983 SESSION OF DEPARTMENT OF BIOMEDICAL SCIENCES, USSR ACADEMY OF MEDICAL SCIENCES, ON BIOLOGICALLY ACTIVE PEPTIDES

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 30, No 3, May-Jun 84 pp 91-98

[Article by M. N. Rybakova (Moscow)]

[Text] A scientific session of the Department of Biomedical Sciences, USSR Academy of Medical Sciences, convened on 23-24 June 1983 to discuss the problem of "Biologically active peptides." This session drew the attention of many scientists from scientific research institutions of the USSR Academy of Medical Sciences and other scientific institutions, as well as practicing physicians. A total of 558 representatives of medical science and Soviet public health care, participated in the work of the session; they included 3 academicians of the USSR Academy of Sciences, 13 academicians of the USSR Academy of Medical Sciences, 1 academician of the Latvian Academy of Sciences, 2 corresponding members of the USSR Academy of Sciences, 27 corresponding members of the USSR Academy of Medical Sciences, 55 professors and doctors of sciences, 200 candidates of sciences. Various cities of the Soviet Union were represented among the participants: Moscow--537, Leningrad--10, Kiev and Kharkov--4, Riga and Tallin--3, Tbilisi, Kazan, Krasnodar, Ryazan--4. Scientists in different specialties participated at the session: biochemists (165), physiologists (115), chemists (60), pharmacologists (35), pathophysiology (30), endocrinologists, pathoanatomists, histologists, immunologists, electrophysiologists (120) and others.

In his opening remarks, Academician N. N. Blokhin, president of the USSR Academy of Medical Sciences, Hero of Socialist Labor, stressed the importance of theoretical research in the area of biologically active peptides. Academician N. N. Blokhin stated that this session is dedicated to the memory of N. A. Yudayev, academician-secretary of the Department of Biomedical Sciences of the USSR Academy of Medical Sciences and academician of this Academy, who recently passed away (on 14 June 1983); he was an outstanding biochemist and endocrinologist, who did much work to organize and prepare for this session.

S. S. DEBOV, vice president of the USSR Academy of Medical Sciences, academician of the USSR Academy of Medical Sciences, commented in his introductory remarks on the importance and relevance of the problem of "Biologically active peptides" being discussed at this session. The speaker stressed that the topics of the session were quite timely, covering the interests of specialists in different fields and making a significant contribution to development of this problem.

It should be noted that biologically active peptides are a very ancient form of regulation of biological metabolic processes. In addition, biologically active peptides also have multifaceted effects. They not only control the most complicated functions of the central nervous system (CNS), but participate as regulators in various vital processes. At the present time, there is interest in the question of clinical use of biologically active peptides. It was noted that an increasing number of peptides are of practical value and used in clinical practice. It can be assumed that they will be used in the future to control emotional states and treat a number of neurological and mental diseases.

It is known that, in our country, several scientific teams are studying biologically active peptides. They include the All-Union Cardiological Research Center of the USSR Academy of Medical Sciences (which generously provided its auditorium for this session), where some very important work is in progress on synthesis and introduction to clinical practice of various peptides, the Institute of Biological and Medical Chemistry, USSR Academy of Medical Sciences, Institute of Enzymology, USSR Academy of Medical Sciences, Institute of Endocrinology and Hormone Chemistry, USSR Academy of Medical Sciences, and others. Much work is being done in Riga, at the Institute of Organic Synthesis, Latvian Academy of Sciences. For this reason, it is not by chance that the Department of Biomedical Sciences of the USSR Academy of Medical Sciences decided to discuss expressly this matter at the session.

Several teams working in this field are represented. We must hear how work is being done and what plans there are for future research. It is important to discuss the matter of coordinating work in this area. A special program for the study of biologically active peptides has been prepared along the line of the USSR Academy of Medical Sciences. Anyone who is working in this field and wishes to do so is invited to participate in this program.

S. S. Debov believes that this session will be an important stage in development of the problem in question. He wished much success to all participants.

A total of 15 papers, which were on the agenda, were delivered and 10 session participants were involved in the discussions.

The proceedings of the scientific session reflect the basic directions of research and advances in the problem of biologically active peptides, study of both synthesis and mechanisms of action of peptides and their analogues. Some strides have been made in the study of physiological, biochemical properties and pharmacological activity of naturally occurring hormonal peptides and their analogues: opioid peptides, fragments of ACTH and somatotropin, angiotensin, vasopressin, tuftsin, peptide of delta sleep and other compounds. Synthetic tiroliberin has been introduced to public health practice. The opioid peptide, daralgin, and the hypotensive-action peptide, teprotid, are at the introduction stage. A preclinical study is in progress of original analogues of ACTH 4-10 and tuftsin. The first domestic systems of bacterial synthesis of enkephalins, bradykinin and angiotensin II have been developed. Work has been deployed to investigate the role of neuropeptides in mechanisms of emotional reactions, modulation of functions of the synaptic and receptor systems of neurons, and effects of classical transmitters; the role of regulatory peptides (RP) in

mechanisms of behavior, induction of pathological states. An important direction is the study and use of biologically active substances in cardiological practice, identification of their role in pathogenesis of cardiovascular diseases and pathology of shock manifestations.

In addition, it was noted at the session that theoretical research on the problem under discussion and, particularly, applied investigations dealing with introduction of results to clinical practice are not being pursued to a sufficient extent and, in part, without coordination. The search for new biologically active peptides approaches to their biological and chemical synthesis, as well as investigation of immunopathological states related to RP are still proceeding too slowly. There is insufficient deployment of work to introduce already discovered peptides to practice due to the extremely limited base and raw materials for their experimental and industrial production.

The speech of V. V. SHERSTNEV (Moscow) was concerned with new approaches and methods of specific search for physiologically active peptides and investigation of molecular mechanisms of their action. One of this approaches is the possibility of isolating and studying endogenous oligopeptide ligands of brain-specific proteins, which are protein compounds unique to nerve tissue. Brain-specific proteins can presently be viewed as the key components of molecular organization of specific functions of the brain and its cellular elements.

V. V. Sherstnev told about the studies, which have been pursued for several years in the Laboratory of Molecular Neurophysiology and Biochemistry at the Institute of Normal Physiology imeni P. K. Anokhin, USSR Academy of Medical Sciences, where it was experimentally demonstrated for the first time that there is functional interaction on the neuronal and behavioral level between systems of brain-specific proteins and naturally occurring oligopeptides (1981-1983). These data served as the basis for an experimental attempt to isolate from brain tissue oligopeptides with affine interaction with brain-specific proteins. This work was done in collaboration with S. V. Belyayev and N. P. Lysova, who are on the staff of the Department of Biotechnology at the Institute of Bioorganic Chemistry imeni I. M. Shemyakin, USSR Academy of Sciences. When a total extract of bovine brain oligopeptides was passed through a column with protein S-100 immobilized on sepharose, a fraction was isolated that showed affine interaction with brain-specific proteins. According to the results of isotachoforetic analysis, this fraction contained at least 8 components, 4 of which had a positive charge and the others, a negative one. The peptide nature of the material of this fraction was demonstrated, and determination was made of the range of molecular weights of its components, which is 800-1000 dalton. The fraction was separated into positively and negatively charged ligands of S-100 group proteins.

The isolated oligopeptide ligands were tested for demonstration of possible physiological activity. Analysis of changes in rat behavior after injection of positively and negatively charged ligands of S-100 protein in doses of about 0.3-1 nmol into the lateral ventricle of the brain revealed that these oligopeptides modified significantly and in different directions avoidance behavior elicited by nociceptive stimuli, without a noticeable effect on motor and orienting activity of the animals. It was assumed that there is suppression of fear before a situation of receiving a nociceptive stimulus by

by anion ligands and intensification of the fear state by cation peptides. It was remarkable that the behavioral effects induced by a single injection of protein S-100 ligands, particularly cations, lasted for a considerable time. The behavioral changes in the animals lasted for 2 weeks (V. V. Sherstnev et al., 1983). The experiments of N. N. Galeva and V. P. Nikitin revealed, as reported by V. V. Sherstnev, that the isolated oligopeptide ligands modify bioelectrical activity and reactions of neurons in the snail [Helix pomatia L.] CNS to transmitters, and the anion and cation peptides may affect neuronal activity in different directions.

It was noted that affine isolation of ligands of group S-100 brain-specific proteins from an overall extract of brain oligopeptides was characterized by insignificant yield of material, making further work appreciably difficult. In order to increase the effectiveness of isolation of oligopeptide ligands of S-100 proteins with behavioral activity, the total extract of brain oligopeptides was submitted to separation, and the isolated fractions were tested for functional activity. Since the hypothesis arose in preliminary experiments that there is a link between S-100 protein peptide ligands and modulation of the fear state, testing was done on an experimental model specially directed to demonstration of development of fear in animals. For this purpose, water-deprived rats were placed in a chamber with a water bottle where they had the possibility to quench their thirst. While drinking, an electric shock of 0.5 to 3 mA was delivered to the rat, which caused it to stop drinking and move away from the bottle. Electronociceptive stimuli were delivered in random order while the animal drank, and without any warning signals, so that no rigid stereotype could develop in the rat. In most rats, the following typical reaction was formed under conditions of this model: the rat headed for the bottle and, before reaching it, turned abruptly back, as it did from an electric stimulus, although the experimental conditions called for delivering the shock only if the rat came in contact with the water. Such reactions are viewed as one of the manifestations of the fear reaction in the animal. For this reason, the ratio of number of times the rat moved away from the bottle before touching the water to number of electric shocks it received served as the main indicator of development of the fear state. The number and duration of periods of exploratory activity, comfortable behavior and inactivity of rats were also recorded. A comparison of these parameters is indicative of animal activity and could indirectly reflect the state of fear. Testing with this model of the peptide fractions isolated in the course of separating a total extract of bovine brain oligopeptides revealed, according to the report of V. V. Sherstnev, that some of the fractions, when injected intraperitoneally, led to reliable increase in number of turns away from the bottle in the absence of electric nociceptive stimuli. The observed behavioral changes, according to the aggregate of indicators, were indicative of development of a fear state in the rats. The most distinctive findings were demonstrable starting on the 2d day after injection of the fractions. There were no marked changes in overall motor activity or behavioral disturbances in rats kept together in the same cage. The fractions with the above-described behavioral activity were purified crudely and, according to gel filtration results, had an average molecular weight of about 800 dalton. When binding of the peptide material with S-100 proteins was checked, it was separated into two subfractions, one that did not and one that did interact with protein S-100 immobilized on a column. Testing of physiological activity related to modulation of fear

revealed that it was retained only in the subfraction that interacts affinely with brain-specific group S-100 proteins.

Thus, species-nonspecific oligopeptide factors were found in mammalian brain tissue, which are characterized by selective behavioral and neurotropic activity, and interact specifically with brain-specific group S-100 proteins.

The experimental data submitted by V. V. Sherstnev are indicative of the potential benefit of the approach under development, both with regard to isolation of oligopeptides with selective physiological activity, and for investigation of their functional role and molecular mechanisms of action.

The paper of L. F. PANCHENKO (Moscow) dealt with opioid peptides and pathogenesis of alcoholism.

In recent times, it has become apparent that there are common elements in the mechanisms of formation of various addictions and alcohol dependence. Involvement of endogenous opioid peptides may be such a common link. It is known that opiate systems are mediators of the effect of alcohol on catecholaminergic structures of the brain; for this reason, it is extremely necessary to study enkephalins and endorphins, their neuronal receptors and enzymes of metabolism of endogenous opioids in order to comprehend neurochemical mechanisms. It was noted that, with chronic intake of alcohol, there is depression of endogenous opioid synthesis in response to hyperstimulation of opiate receptors. Thus, discontinuation of alcohol intake, like that of morphine, leads to a shortage of opioid neuropeptides in enkephalinergic and endorphinergic conductors. This causes an imbalance in other related transmitter systems and, ultimately, constitutes the basis for formation of the withdrawal state.

L. F. Panchenko told about the research being done by the staff of the Institute of General and Forensic Psychiatry imeni V. P. Serbskiy, USSR Ministry of Health, based at the Institute of Bioorganic Chemistry imeni M. M. Shemyakin, USSR Academy of Sciences, dealing with the dynamics of activity of the enzyme, enkephalinase A, in the presence of alcoholic intoxication, in different parts of the rat brain. Using thin-layer chromatography for quantitative assay of  $^3\text{H}$ -tyr-gly-gly, it was demonstrated that acute and chronic intake of ethanol elicits activation of this enzyme in the midbrain and corpora striata. There was less marked activation of the enzyme with chronic intake of ethanol. Perhaps, this effect can be attributed to adaptation changes, which were observed in nerve tissue with chronic presence of alcohol.

Preincubation of brain tissue with ethyl alcohol elicits dose-dependent activation of enkephalinase A in the midbrain and striatum which, in the opinion of L. F. Panchenko, is due to the effect of alcohol on brain cell membranes, rather than its metabolites or change in functional state of enkephalin receptors.

As we know, enkephalinase A is the principal enzyme for physiological inactivation of enkephalins in the synaptic fissure and, consequently, the activation that the above speaker discovered in this enzyme in the presence of alcoholic intoxication is one more pathogenetic factor that lowers the levels of

naturally occurring opioids in enkephalinergic conductors and, as a consequence, aggravates the clinical withdrawal signs. Perhaps, in the future drugs that selectively depress enkephalinase A activity and thereby eliminate the neuropeptide deficiency will become effective in the treatment of the alcohol withdrawal syndrome.

In conclusion, L. F. Panchenko discussed experiments conducted on the same animals with formed alcohol dependence with an integrated study of all elements of the opiate systems: levels of endogenous enkephalins in the striatum and mesencephalon, binding of opioid ligands with receptors and activity of enkephalinase A. It was shown that activation of enkephalinase A is associated with a decrease in leu-enkephalin content of the striatum; 48 h after withdrawing ethanol from the animals, activity of this enzyme dropped to control values, while binding and levels of enkephalins increased; the demonstrated changes became more marked after 10 days. The decline in enkephalinase A activity observed in animals after discontinuation of alcohol intake is perhaps an adaptive reaction to the occurring enkephalin shortage in enkephalinergic synapses and has pathogenetic significance to elimination of the withdrawal state.

Thus, it can be assumed that the disturbances referable to the main elements of the enkephalinergic opiate system under the effect of alcohol, which were found by L. F. Panchenko et al., are apparently the triggering mechanism of the alcohol dependence and tolerance phenomena, and perhaps they are the metabolic basis of formation of toxic-mimic effects of alcohol.

O. I. SUKMANSKIY (Dnepropetrovsk) discussed the rather important issues stressed in the paper of I. P. Ashmarin: timeliness and urgency of setting up RP production in sufficient quantities for experimental studies and clinical trials, namely such a source of active peptides as the salivary glands. Experimental data were obtained in the Department of Pathological Physiology of Dnepropetrovsk Medical Institute, which are indicative of isolation from mouse (as well as other animals) salivary glands of active peptides, such as factors of nerve growth (NGF), epidermis growth (EGF) mesoderm growth, thymocyte-transforming factor, lethality factor, parotin, kallikrein, renin, tonin, erythropoietin, insulinoid substance, glucagon, etc. Some of these factors have been fully described as to structure, and there are grounds to assume that they are hormonal in nature. For example, in the words of O. I. Sukmanskiy, NGF (its active subunits) consists of 2 identical peptide chains each with 118 amino acid radicals, while EGF is a peptide with 53 amino acid radicals. NGF plays an important part in development and maintenance of integrity of the sympathetic nervous system, while administration of antiserum against NGF to neonate animals elicits "immunosympathectomy." EGF (it is also urogastron) is widespread in the animal kingdom, and it is apparently close to insulin in its biological significance to growth and development of a number of tissues (as indicated by studies involving serum-free cell cultivation). O. I. Sukmanskiy et al. obtained basically new facts from a study of NGF, EGF, as well as insulin, concerning interaction of active peptides and hormones with their cellular receptors and internalization of hormone-receptor complexes; it was also stressed that active peptides are contained in enormous concentrations in salivary glands, particularly in male mice. Thus, the submandibular gland

has 6 times more NGF activity than snake venom and 6000 times more than the tumor that was the original source of this factor. EGF content of the submandibular glands constitutes up to 0.6 mg purified peptide per gram gland tissue, which makes these organs a valuable source for isolation of active peptides.

O. I. Sukmanskiy also shed light on some theoretical aspects of the problem that are of general relevance: one can assume that several peptides of the salivary glands, like some neuropeptides, have the same origin from larger molecular precursors by means of posttranslational enzymatic processing, which was demonstrated in the paper of Yu. A. Pankov. O. I. Sukmanskiy had already voiced the idea of common origin of several active peptides of salivary glands 10 years ago (survey in 1972). At present, this idea is better validated by the newly recovered factors; for example, NGF and EGF are referable to insulin-like substances; it is known that the two subunits of NGF and binding protein of EGF, as well as the mesoderm growth factor and lethality factor have esteropeptidase (BAEE-esterase) activity with kallikrein activity. In turn, in studies of the biological activity of purified kallikrein from salivary glands, which was isolated by Prof A. P. Levitskiy, O. I. Sukmanskiy proved that kallikrein has a calcipetic effect similar to the effect of another secretion of the salivary glands, parotin. Another distinction of the salivary glands is that they excrete several active factors (NGF, EGF, renin, tannin, kallikrein, parotin) both into blood and saliva, which resembles the intraluminal excretion of several gastrointestinal hormones, indicative of a closer link between exocrine and endocrine processes.

The salivary glands are inherently closely linked with other secretory organs (hypophysis, reproductive glands, thyroid, adrenals). There is also distinct demonstration of a link with the nervous system: NGF level in human blood rises in the presence of certain nerve tissue tumors.

In this regard, the question of possible referral of some cellular elements of salivary glands (primarily the salivary tubules--convoluted ducts) to the diffuse neuroendocrine system, which is the source of many peptides of the brain and digestive system, could be posed for further investigations.

P. K. KLIMOV (Leningrad) devoted his paper to investigation of physiological properties of several peptides, which he pursued at the Institute of Physiology imeni I. P. Pavlov starting in 1965, paying attention to an important circumstance: the mode of use of exogenous peptide could alter appreciably the ultimate effect of the agent. For example, intravenous infusion of somatostatin depresses markedly stimulated secretion of the stomach and pancreas. The same peptide, given to the same animal but in the hypothalamus (caudate nucleus or other subcortical elements of the brain) markedly increases secretion in the same organs. Such differences in effects when peptides are administered peripherally or centrally are observed with use of leu-enkephalin or its analogues, TRH [thyrotropin-releasing hormone] and other peptides.

P. K. Klimov submitted experimental data which stressed the complex and mandatory interaction that exists between neuropeptides both in the brain and autonomous nervous system. When secretin, as well as enkaphalins and their

analogues, somatostatin, glucagon, TRH, neuropeptides, bombesin and others, are injected in the third ventricle, there is virtually immediate functional change in endocrine cells of the stomach or nerve endings of the intramural nervous plexus which contain gastrin, neuropeptides, serotonin, gastrin, releasing hormone and other peptides: there was accumulation in them of secretory granules or, on the contrary, release of contents of secretory granules. There was concurrent change in quantities of endogenous peptides (enkephalin, glucagon, somatostatin, neuropeptides, insulin, gastrin and others) in blood serum. One of the important conclusions from such findings is that when trying to use peptide hormones and releasing factors in diagnostic or therapeutic practice one must be well-aware of the possible consequences, that are inevitable after general stimulation of the neuroendocrine-endocrine-paracrine (hormonal) system.

P. K. Klimov called attention also to the fact that the end effect of a given peptide is not necessarily related to its interaction with the membrane of the target cell. Peptidergic cells of the CNS are of necessity under the influence of monoamine-containing (norepinephrine, dopamine, serotonin) neurons. Cells containing peptides (gastrin, enkephalins, TRH, somatostatin and others) and catecholamine are next to one another on the periphery, in the gastric mucosa for example. The overall effect of the selected peptide on the body will almost necessarily include effects due to hormonal and neuronal systems. Our present level of knowledge is such that its generalization is necessary, not only to theory, but as a guideline for clinical use of biologically active RP.

K. S. RAYEVSKIY (Moscow) devoted his speech to the link between endogenous peptides and neuroleptic properties. He stressed that one of the naturally occurring neuropeptides discovered in brain tissue is des-tyrosine-gamma-endorphin (DTGE), which resembles neuroleptics in several pharmacological features. DTGE, which was synthesized in the Laboratory of Peptide Synthesis at the All-Union Cardiological Research Center of the USSR Academy of Medical Sciences (by M. I. Titov), was studied in comparison to the standard neuroleptic, haloperidol, using methodological procedures that made it possible to characterize the pharmacological and neurochemical spectrum of this product. As shown in the laboratory of A. Yu. Shemanov, when given systematically in small doses to animals, DTGE elicits catalepsy and accelerates the process of extinction of the conditioned active avoidance reflex, which suggests that this peptide has the capacity of affecting central dopaminergic transmission. In experiments on synaptosomes from two of the functionally most important dopaminergic structures of the brain—striatum and adjacent nucleus—DTGE manifested the capacity to inhibit presynaptic processes of dopamine release and enzymatic hydroxylation of tyrosine, which is the limiting element in dopamine biosynthesis that provides for dopaminergic neurotransmission in the nigrostriate and mesolimbic systems of the brain. In the opinion of the speaker, unlike typical neuroleptics, the effect of DTGE is unrelated to an influence on presynaptic dopamine receptors, but is transmitted by other mechanisms. Nor is this effect due to an influence on opiate receptors localized on the dopaminergic terminals of the striatum, since it is not reproduced in the presence of an analogon: concentration of opioid peptide (synthetic analogue of enkephalins). The speaker's own data, as well as some of the information in the literature, concerning neuroleptic properties of such endogenous peptides as neuropeptides and cholecystokinin, are indicative of the potential benefit of searching for substances with potential psychotropic activity among peptides and their analogues.

R. I. KRUGLIKOV (Moscow) observed that the peptide problem as a whole and the question of involvement of peptides in learning and memory processes are experiencing a particularly noteworthy phase: the period of initial accumulation of facts, mainly phenomenological data, is coming to an end or has ended, and the period of their interpretation is starting, of searching for the mechanisms of their action and validation of guidelines for their therapeutic use. Under such conditions, a well-thought out program and wise methodology are the main prerequisites for effectiveness of future studies. R. I. Kruglikov observed that the papers delivered at the session demonstrated convincingly the extreme breadth of the spectrum of biological effects of peptides, their polyfunctional nature. It is quite apparent that the influence of peptides on a given function includes an effect both on the mechanisms of this function and mechanisms of regulating it. As applied to learning and memory processes, this problem acquires very concrete features. It is extremely important to determine the direction of the search for mechanisms of biological effects of peptides. It is unlikely that peptides express their effects through some unusual, basically new physiological and molecular mechanisms. The conception that peptide effects are expressed through already known mechanisms, among which are neurotransmitter systems, is more plausible. In the words of R. I. Kruglikov, the data submitted in the paper of A. V. Val'dman, in which it was convincingly shown that the psychotropic effects of short peptides are expressed through the monoaminergic systems of the brain, could serve as confirmation of that statement. At the present time, there are sufficient grounds to believe that many effects of neuropeptides are based on their interaction with neurotransmitter systems of the brain. We are dealing here expressly with interaction, rather than unilateral effects of peptides on these systems. Hence, one of the promising routes for disclosing the mechanisms of effects of neuropeptides is a comprehensive, purposeful study of interaction between neuropeptides and neurotransmitter systems of the brain. In addition, R. I. Kruglikov stressed in this report that the effects of neuropeptides depend on individual distinctions and functional state of an organism. It seems to be very obvious that there is an urgent need to develop and use tests with which one could form animal groups that would be as homogeneous as possible. Prebreeding of animals according to learning speed, with formation of groups of fast and slow learners, could be beneficial for the study of the effect of peptides on learning and memory processes. It should be borne in mind, when assessing the role of individual distinctions of animals in effects of neuropeptides, that body neuropeptide content is also one of the factors that determines individual distinctions. Under such conditions, administration of the same dosage of a peptide could compensate for an initial shortage of it in some animals and lead to excessive accumulation, with the ensuing consequences, in others. Aside from individual distinctions of animals, observed R. I. Kruglikov, it is necessary to consider just as carefully such factors as the models of learning and memory that are used, season, animal group (it is known that different animal groups could differ substantially in learning and memory indicators), time of day, etc. Special attention should be given to the functional condition of animals when conducting experiments with use of neuropeptides. Aside from general functional state, the functional state of specific neuronal populations involved in expression of some cerebral function may also be of substantial significance. In this regard, the hypothesis of A. M. Ivanitskiy merits attention, we refer to the selective effect of vasoressin on the system of neurons that are activated during specific processes

of nerve activity. All of the above factors together could determine not only the extent, but direction of neuropeptide effects. One would think that the contradiction of data concerning the influence of neuropeptides on learning and memory processes is largely attributable to inadequate consideration of the role of these factors. In the opinion of R. I. Kruglikov, the peptide problem as a whole has changed into a typical multidisciplinary problem. The intensive development of such problems is associated with some costs, one of which is that researchers are somewhat "confined" to their disciplines. A manifestation of such "confinement" is, in particular, that researchers are usually well-acquainted with the literature about "their own" range of questions and much less familiar with the literature of allied disciplines. R. I. Kruglikov suggested that publication of a special journal be organized to deal with peptides, with consideration of the need to use the most effective strategy and methodology of investigations in this field, which would be very desirable and beneficial.

S. A. CHEPURNOV (Moscow) discussed the physiological aspects of clinical use of oligopeptides as related to their central action, and the prospects of basic research formulated in the paper of I. P. Ashmarin, academician of the USSR Academy of Medical Sciences. This speaker stressed the fact that use of liberins and statins in pharmacological doses in psychiatry affects endogenous feedback in the regulatory hypothalamohypophyseal system; conversely, their use to normalize hormonal homeostasis affects the function of brain structures responsible for emotional and other complex forms of behavior. This contradiction is overcome by developing peptide analogues, in which there is deliberate enhancement or attenuation of neuroendocrine or psychotropic properties. With reference to the role of peptides in systemic organization of motivational behavior, the speaker stressed the novelty of the approach to investigation of the role of vasoactive peptides using the different behavior models described in the paper of K. V. Sudakov, corresponding member of the USSR Academy of Medical Sciences. A striking fact was observed: against the background of a peptide effect, with stimulation of specific hypothalamic zones behavioral effects were demonstrated that are not inherent in the given motivation. As compared to experiments where peptides modified motivational defense excitation, of even greater interest is the triggering of systemic alimentary behavior by giving gastrin to fed animals. S. A. Chepurnov mentioned this fact as an example of the specific central action of gastrointestinal hormones. To confirm this thesis, he cited his own experimental data on the effect of somatostatin on limbic structures of the animal brain, which were obtained with microionophoretic delivery of the neuropeptide into the region of a single amygdalar cell. Somatostatin mainly intensified the activity of cells of the amygdalar nucleus, stimulation of which facilitates secretion of growth hormone. Chronic deafferentation of the amygdalla by severing its peptidergic and other connections with the hypothalamus led to heightened sensitivity of the amygdalla to somatostatin. Conversely, a decrease in neuronal sensitivity to somatostatin was obtained by using norepinephrine which, consequently, blocked the feedback mechanism effected by somatostatin. These data are interesting in view of the fact that, in turn, norepinephrine enhances secretion and passage into blood of somatostatin. The discussed mechanism of somatostatin feedback in brain structures turned out to be different on the amygdalar and hypothalamic levels, and with delivery of somatostatin from cerebrospinal fluid, we can discuss the system of nervous and

hormonal regulations, not only for growth hormone, but other tropic hormones of the hypophysis, which is confirmed by clinical findings of significant elevation of somatostatin level in spinal fluid in the presence of some diseases of the spinal cord and brain.

The speaker also discussed the mechanisms of action of melanostatin, stressing that information about the molecular mechanisms of its action was submitted for the first time in the paper of A. V. Val'dman, academician of the USSR Academy of Medical Sciences. S. A. Chepurnov and his colleagues in the Department of Human and Animal Physiology at Moscow University imeni M. V. Lomonosov, established experimentally that, when given intraventricularly to rats, melanostatin alters electrical activity of limbic structures; its effects are relieved by morphine, but preadministration of melanostatin blocks the effects of subsequently administered threshold dosage of morphine. The integrity of ascending noradrenergic pathways plays a substantial role in manifestation of the central effect of melanostatin, since transection of the dorsal fascicle of the brain eliminated the electrographic and behavioral effects of melanostatin. The direct influence of somatostatin and melanostatin on neurons is, in the opinion of the speaker, indicative of only one element in the possible mechanisms of feedback. At the same time, it is obvious that further investigation of molecular mechanisms of antisecretory effect of somatostatin and melanostatin (for example, for somatostatin, with regard to growth hormone, thyrotropin, insulin, glucagon) and their influence on neuronal excitability is needed. It can also be assumed that this is a single mechanism, which is related to membrane calcium canals. Knowledge about the quantitative proportions of neuropeptides in blood, spinal fluid, brain tissues under normal and pathological conditions is also needed for physiological evaluation of the role and effects of neuropeptides.

V. D. SLEPUSHKIN (Tomsk) indicated that the existence of powerful parallel effects is one of the difficulties involved in studying and introducing neuropeptides to clinical practice. This circumstance is indeed an obstacle to the clinician, but not the experimenter. He clarified this citing examples of scientific research conducted by the staff of the Laboratory of Pathophysiology at the Siberian Affiliate of VKNTs [All-Union Cardiological Research Center] of the USSR Academy of Medical Sciences.

In investigating the effect if synthetic analogues of enkephalins on parameters of fluid-electrolyte homeostasis under physiological conditions and with simulation of some pathological states (the synthetic enkephalin analogues were furnished by the Laboratory of Peptide Synthesis, VKNTs, USSR Academy of Medical Sciences), we discovered that several analogues also have a distinct antishock activity. It was possible to establish that the mechanism of anti-shock effect of neuropeptides is based on their normalizing influence on hemodynamic, fluid-electrolyte and acid-base homeostasis parameters. There was also normalization of endocrine system function under the effect of enkephalins, in particular, there was restoration of adrenocortical function to the base level, decrease in vasopressin and thyroxine levels in blood. These effects were specific, since they could be eliminated by the neuropeptide blocking agent, naloxone.

V. D. Slepushkin then discussed the facts submitted in the paper of V. A. Vinogradov about a clinical trial of the pharmacological agent, dalargin.

Indeed, in a study of this agent with regard to its effect on hemodynamics, V. D. Slepushkin discovered another property, just as interesting to clinicians as the anti-ulcer effect described by V. A. Vinogradov.

Thus, on models of experimental acute myocardial necrosis, it was found that there was decrease in activity in the animals' blood of several enzymes characterizing the presence of myocardial ischemia under the influence of dalargin: MB creatine kinase, lactate dehydrogenase, aspartate and alanine aminotransferases. Normalization of ECG parameters was also observed. The results warranted the assumption that this analogue of leu-enkephalin causes restriction of the zone of myocardial ischemia. Evidently, limitation of deleterious effects on the myocardium of excessive amounts of catecholamines is the basis of the mechanism of this effect. The possibility cannot be ruled out also that the agent is instrumental in stabilizing cardiomyocyte membranes. With these experimental data in mind, clinical trials of dalargin on patients with acute myocardial infarction have begun in clinics of the Siberian Affiliate of VKNTs of the USSR Academy of Medical Sciences. The findings of V. D. Slepushkin et al. are also of theoretical interest, in the sense that neuropeptides can interrupt a stress reaction or, in other words, they have an antistressor action. Thus, in studies of neuropeptides and, particularly, their synthetic analogues, there are indeed frequent concurrent effects which, in a number of instances, have the same theoretical and practical interest as the basic effects of a given agent.

N. N. ZAYKO (Kiev) stated that much attention should be devoted to the effect of peptides that have a so-called impulsation effect when studying nervous trophics. RP may also be involved in allergic reactions. When examining peptide regulators, it is also important not to relax attention to numerous other regulators (for example, prostaglandin).

N. N. Zayko voiced his wish to invite representatives from different regions of the Soviet Union as speakers when organizing the next scientific sessions.

N. Yu. BELENKOV (Leningrad) discussed restoration of brain functions after mechanical injury, and submitted experimental data on the role of physiologically active substances in spinal fluid in processes of restoration of impaired functions; he expounded the hypothesis that the noted effects are related to polypeptide functions.

In his closing remarks, I. P. ASHMARIN (Moscow), academician of the USSR Academy of Medical Sciences, stressed the fact that it was not so much general survey materials as papers with valuable innovative results of Soviet work in the field of both theory and applied aspects of RP research that were delivered at the session.

The discovery by Yu. A. Pankov et al. of a "fourth" opioid structure, so-called forphin, is important and quite original in methodological approach. G. A. Vartanyan et al. submitted original data on the amino acid composition of the oligopeptide lateralization factor, which was first isolated at the Institute of Experimental Medicine, USSR Academy of Medical Sciences. A new type of biological activity of practical importance was established for the

delta-sleep peptide, a strong antistress effect (K. V. Sudakov et al.) and there was discussion of several physiological patterns in the action of RP. On the basis of generalization of a wide range of experimental data, there has been formulation of theoretical theses and proposal for practical studies of new immunostimulator peptides: original analogues of muramyl peptides and fragments of thymus peptides (V. T. Ivanov), as well as analogues (G. I. Chipens). Investigation of the effects of several oligopeptides on monoaminergic processes in the brain enabled A. V. Val'dman et al. to demonstrate new connections of various systems of chemical regulation and disclose psychotropic properties of tuftsin and its analogues of clinical value. The fine mechanisms of action of carnosine and anserine, which are long-known dipeptides but still a mystery with respect to functions, in myoneural synapses were disclosed in the paper of S. Ye. Severin. The paper of I. P. Ashmarin observed that it was established for the first time at the Institute of Physiology imeni I. P. Pavlov, USSR Academy of Medical Sciences, and Brain Institute, USSR Academy of Medical Sciences, that the effects of a single administration of some opioid peptides last for a rather long time (up to several weeks); an original analogue of the 4th-7th fragment of ACTH, which stimulates attention and immediate recall and has prolonged action, was developed at the Institute of Molecular Genetics, USSR Academy of Sciences, and Moscow University imeni M. V. Lomonosov, and has been prepared for preclinical studies.

An important practical result of a large cycle of studies by Academician Ye. I. Chazov et al. of analogues of opioid peptides is that an original compound, dalargin, is being introduced to clinical practice for treatment of peptic ulcer. Solid theoretical, experimental and clinical studies of peptides with hypotensive action, which regulate synthesis of angiotensin II, were described in the paper of V. N. Orekhovich et al. An integral idea of the assumed involvement of different RP in regulation of blood pressure was offered by O. A. Gomazkov, while the most complete summary of original conceptions of the role of RP in most pathological processes was given by G. N. Kryzhanovskiy. An extremely interesting clinical aspect of using peptides that stimulate memory was discussed in the paper of G. V. Morozov and A. M. Ivanitskiy, who described a method for enhancing significantly the efficacy of reflex therapy of alcoholism with lysine-vasopressin. Original data were submitted by L. F. Panchenko on the role of enkephalinases in development of experimental alcohol dependence. Diagnostic and prognostic possibilities being offered to clinical psychiatry by assaying concentrations of opioid RP in body media were summarized in the paper delivered by M. Ye. Vartanyan.

With all the qualities of the papers and session as a whole, which consisted of the priority, solidity and practical impact of the submitted materials, we cannot fail to mention slow introduction to clinical practice as the main flaw in the work with RP. It was the general opinion of participants at the session that formation of high-power groups of large-laboratory synthesis at some of the leading institutes of the USSR Academy of Sciences and Academy of Medical Sciences would be an extremely important measure to accelerate this process; their tasks would consist of providing standard peptide materials in sufficient quantities, on the order of tens of grams per year (in view of the extremely low effective doses of RP), for preclinical and clinical studies.

**Decree Adopted by the General Meeting of the Department of Biomedical Sciences,  
USSR Academy of Medical Sciences, on the Problem of 'Biologically Active  
Peptides,' 23-24 June 1983, Moscow**

Along the line of the Department of Biomedical Sciences, USSR Academy of Medical Sciences, the most important research is in chemistry, biology, physiology, pharmacology, biological and chemical synthesis of highly active peptide compounds, determination of the role of endogenous neurohumoral peptide factors in modulation of central nervous system functions, investigation of structural-functional organization and clinical use of peptides.

Attention must be given to the need to develop new peptide products that would be effective in the treatment and prevention of cardiovascular, endocrine, neurological and psychiatric, gastrointestinal and other diseases, including development of synthetic peptide (molecular) vaccines.

The session of the Department of Biomedical Sciences, USSR Academy of Medical Sciences, hereby resolves:

To ask the Presidium of the USSR Academy of Medical Sciences:

To examine the need for establishing production bases (large-laboratory synthesis groups) in institutions under the USSR Academy of Medical Sciences that are working on chemical synthesis of peptides in order to expedite introduction to public health practice of medical peptides.

To ask the Presidium of the USSR Academy of Sciences to set up large-laboratory production of peptides with potential medical application at institutes of molecular genetics, bioorganic chemistry and others, as well as to prepare an integrated special-target program for their preclinical investigation, preparation of documents referable to standards and specifications to be submitted to the Pharmaceutical Committee of the USSR Ministry of Health.

To commission the Scientific Council for Planning and Coordination of Molecular and Biological Research in Medicine, USSR Academy of Medical Sciences, to intensify work dealing with coordination of research on biologically active peptides being conducted in institutions of the USSR Academy of Medical Sciences.

To deem it expedient to expand joint work by institutions under the USSR Academy of Medical Sciences and institutes of the USSR Academy of Sciences, which are working on the problem of peptide bioregulators, and for this purpose to commission the Scientific Council for Planning and Coordination of Molecular and Biological Research in Medicine, USSR Academy of Medical Sciences, to examine the required forms and direction of collaboration, primarily in order to develop new and effective medical products.

To apply to the USSR Ministry of Health and USSR State Committee for Science and Technology for allocation of additional funds to institutions working on biologically active peptides in order to expand research in this direction.

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SYMPORIUM ON MOLECULAR BIOLOGY OF VIRUSES AND GENETIC ENGINEERING

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[Article by V. N. Kalinin, K. B. Fomina, Moscow]

[Excerpts] The Symposium on the Molecular Biology of Viruses and Genetic Engineering took place June 21-23, 1983 in Moscow. It was organized by the Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences. Participating in the symposium were 79 Soviet scientists from 20 scientific-research institutes of Moscow, Riga, Kiev, and Leningrad, and 23 foreign specialists from eight countries (USA, Great Britain, Finland, the FRG, Italy, the GDR, Czechoslovakia and Hungary). Forty papers were presented at three scientific sessions.

Section on Molecular Biology, Biotechnology, and Genetic Engineering

V. M. Zhdanov (USSR). "Prokaryotic and Eukaryotic Systems in the Genetic Engineering of Viral Vaccines." Not all viral proteins by far can be synthesized with the aid of well-designed bacterial systems because they are adapted for expression in the cells of higher eukaryotes. In a number of cases the antigen activity appears only after post-synthetic processing or incorporation into a quaternary structure which does not occur in a bacterial cell. A number of viral proteins can be produced with great efficiency in lower eukaryote cells, i.e., yeasts. Thus, a protein was synthesized in yeasts at the speaker's laboratory that possesses T-antigen activity of the SV40 monkey virus. Genetic engineering methods of producing full-scale viral proteins in a culture of higher eukaryotes will hardly become widely used, with the exception of those viral proteins for whose replication there are no convenient cellular systems. Much more promising are attempts to dismember and express a natural antigen's protective and antigen determinants rather than copy it.

T. I. Tikhonenko (USSR). "Genetic Engineering Approaches to Producing Anti-Viral Vaccines." The genes of a rather large number of proteins have already been cloned within the structure of recombinant DNA. However, full-scale viral proteins cannot always be effectively synthesized in bacteria. Some of them, as for example, the surface protein of the hepatitis B virus, are toxic to bacteria so that it is very difficult to sustain a population of bacteria-producers. Two approaches are being used in the reporter's laboratory to

overcome these kinds of difficulties. In the first place, chemical synthesis of nucleotide series that code amino acid sequences of antigen determinants. This method was used to synthesize the code for one of the antigen determinants of the HB<sub>s</sub>-antigen. After it was incorporated into the structural region of the bacterial gene-carrier in bacteria, a hybrid protein with the expected molecular mass was produced. In the second place, the employment of fine-splitting restrictionases to dismember, from natural nucleotide series, sectors that code antigen determinants, but not those amino acid series with which cytotoxicity is associated. After this kind of sector of a HB<sub>s</sub>-antigen gene was incorporated into a bacterial gene-carrier with the same high degree of efficiency, a protein carrying HB<sub>s</sub>-antigen determinants was expressed.

M. Bezdek (CSSR). "The Use of Prokaryotic Transposons for Transferring Cloned DNA by Gene Manipulations in vivo." The author was able to use a conjugative plasmid with the help of genetic engineering manipulations to introduce an E. coli TN 3 transposon into agrobacterial cells, associated with a lactose operon. The expression of this operon was observed in the agrobacteria.

Yu. Doskochil (CSSR). "The Bacteriophages Bacillus licheniformis and their Phylogenetic Relationships and Research Prospects as Vectors for Cloning DNA." The speaker presented his research results on building bacteriophage genomes of the industrial B. licheniformis microorganism which was undertaken in order to build a vector system based on these phages.

M. Berenchi (Hungarian People's Republic). "The Structure and Function of Cloned Adenoviral DNA." The speaker reported on the unexpected effect of incorporating a foreign DNA of a human type 1 adenovirus along the Hind III site of the widely used pBR322 vector plasmid. Although this kind of procedure was not supposed to affect the beta-lactamase gene, the resistance level to ampicillin, as determined by this gene's product, markedly decreased in the case of ~2/3 recombinants. Also demonstrated was the fact that the E. coli which carry the recombinant plasmids are capable of remaining in the bodies of mice for a prolonged period.

I. I. Granovskiy (USSR). "Cloning and Expression of SV40 and Hepatitis B Virus Genomes in Yeast Cells." Results were cited for experiments on the use of shuttle vectors that replicate in yeasts to build recombinants that carry genomes of the indicated viruses. Data from immunological and biochemical tests in the yeast cells carrying the corresponding recombinants, apparently controlled by the viral regulator elements, indicate the expression of proteins with antigen properties of the SV40 T-antigen and the surface antigen of the hepatitis B virus.

B. S. Narodnitskiy (USSR). "The Adenovirus Genome as an Eukaryotic Vector." Two possible approaches to making an adenovirus vector are examined. The first approach would be to introduce in a human virus (adeno-1) genome an early region sector of the SV40 monkey virus along with the material being cloned. This would provide the recombinant with a selective characteristic, i.e., the capability of being replicated in monkey cells. This is the manner in which a recombinant carrying a complete hepatitis B virus genome was produced and replicated. The second approach is to produce a version of a virus and

delete the region of the genome that does not play an essential role in the virus's replication. The fragment of adenovirus-1 which carries such a region was cloned in the plasmid, and the unessential region of the virus genome that accounted for three percent of the genome's size was removed with the aid of Bal 31 nuclease. After the modified fragment was joined with the remaining segment of the genome, the deleted infectious version of adenovirus-1 was produced.

V. I. Agol (USSR). "Prospects of Investigating the Production of Recombinant Forms of Poliomyelitis Viruses with Assigned Properties." Tentative success has been achieved in the speaker's laboratory in determining the region of a genome that influences virulence as a result of experiments on the genetic recombination of poliomyelitis viruses by two closely positioned markers and a subsequent analysis of progeny.

D. K. L'vov (USSR). "Genetic Stock of Natural Populations of Influenza A Viruses." The gene and protein composition of influenza A viruses separated from natural populations was investigated. The data from that study allowed the researchers to conclude that all of the influenza A viruses can be viewed as a single species that combines an aggregate of populations with a singular defensive gene stock. Various antigen variants of the virus can exist in both human and animal populations. Practically all of the epidemic viruses, both modern as well as those that have long since disappeared from the human population, are found in domestic animals from which they pass over to wild animals. An active exchange of the gene stock of epidemic and non-epidemic viruses takes place in the animal population that includes new gene stock elements from humans. Thus, the animal populations are not only a storehouse of viral gene stock, but also make it possible for new constellations of viral genes to emerge in the virion.

A. G. Bukrinskaya (USSR). "Infiltration of the Genetic Material of the Influenza Virus into a Host Cell." The mechanisms by which the early stages of a viral infection take place were examined: The formation of the "coated vacuole," the receptosome, the fusion of the viral and cellular membrane, and the participation of the viral proteins in the membrane. There subsequently occurs a "stripping" of the virus particle which probably occurs in a two-stage process: The removal of the lipoprotein membrane and the subsequent formation of subviral structures that contain the M protein. This is followed by the removal of the M protein and the release of RNP. Remantadin, which is widely used for the treatment of influenza, prevents the dissociation of protein M and RNP, but the nucleocapsid that is associated with protein M cannot penetrate the nucleus to initiate the transcription of the virus genome.

N. V. Kaverin (USSR). "Differentiated Limitation of Influenza Virus Gene Expression in Heterotypical Mixed Infection." Results are presented for studies of heterotypical interference between influenza A and B viruses during the synthesis of viral macromolecules. The extent to which the synthesis of various virus-specific proteins was suppressed turned out to be variable. Moreover, the nature of these differences remained unchanged in different cellular systems and in the case of different viral strains. A bilateral suppression was observed at specific correlations of infection multiplicity, i.e., not only was the protein synthesis of the weak competitor A suppressed, but the

synthesis of the strong competitor B was also suppressed. This suppression was also differentiated. The picture of secondary transcription suppression corresponded exactly to the picture of translation suppression. No distinct differentiated suppression of primary transcription was observed.

Yu. Z. Gendon (USSR). "Comparative Analysis of Epidemic Strains of Influenza Virus." Homologous genes of the epidemic viruses H1N1, H3N1, H3N2, and B that were isolated in different years were analyzed. Changes were detected not only in the exterior genes, but also in the genes of interior proteins. Moreover, the latter changes were more distinct. Several viral variants of the same serotype that differ in genes of both glycolyzed and non-glycolyzed proteins can coexist and circulate in a population during the course of a single epidemic.

V. M. Zaydes (USSR). "Coagulation of Polypeptide Hemagglutinin Chains of Influenza Virus in Infected Cells." Results were given for a study of the coagulation of polypeptide chains of hemagglutinin which was determined by the formation of intramolecular disulfide bonds. The precursors to the mature form of hemagglutinin are polypeptides which can be detected by electrophoresis under non-reducing conditions as components with the least mobility, and that differ from the mature form by the number or orientation of the disulfide bridges. The cited results point out the post-translation modification of the hemagglutinin polypeptides of the influenza virus that is manifested in the formation or redistribution of intramolecular disulfide bonds. The reason for the "disulfide maturation" of hemagglutinin is apparently the gradual time required for organizing its trimer configuration that leads to the steric convergence of the reacting cysteines.

V. R. Farashyan (USSR). "Genetic Analysis of Influenza Virulence." Results are presented for the study of the pathogenicity (in terms of pneumovirulence) exhibited for mice by the recombinant influenza viruses A/PR/8/34 (pathogenic for mice) and A/Tulane/Massachusetts/1/80 (non-pathogenic for mice) for the purpose of identifying the genes (or composition of genes) that are responsible for the manifestation of a virus's virulent properties in a given system. The substitution of surface glycoproteins--hemagglutinin and neuraminidase--in the pathogenic strain PR/8 by glycoproteins of the non-pathogenic Tulane/80 strain does not lead to a loss of pathogenicity. A detailed analysis of the recombinants produced in the interior proteins showed that all of the examined recombinants which turned out to be pathogenic for mice had a RNA-segment 2 (gene P1) from the pathogenic strain PR/8, whereas the non-pathogenic recombinants had a segment from the Tulane/80 strain. Therefore, the RNA-segment 2 (gene of protein P1) plays a specific role in the formation of the pathogenic properties of the A/PR8 strain.

O. P. Zhirnov (USSR). "Protease Inhibitors as a Method of Treating Influenza and Other Viral Infections." A study was made of the antiviral activity of protease inhibitors ( $\epsilon$ -aminocaproic acid, Gordoks, Kontrikal) in influenza infections. Experiments with cell cultures have demonstrated the capability of protease inhibitors to block the cutting and activation of HA on H1 and H2 which are accomplished by proteolytic enzymes of blood plasma. The highly infectious, activated virus is dominant in the blood of the untreated mice,

whereas a non-infectious virus with uncleaved hemagglutinin was dominant in the mice treated with inhibitors. Thus, in the opinion of the speaker, suppression of proteolytic activation of the influenza virus is the principal mechanism underlying the antiviral action of protease inhibitors in animals. Finally, the therapeutic action of the inhibitors was studied. A protective effect was observed in the experiments on mice and chicks. Pathological changes in the lungs were reduced, and dissemination of the virus in the body was prevented. The administration of protease inhibitors exhibited the same action regardless of the type and strain of the etiological agent.

I. I. Zhilinskaya (USSR). "The Study of the Genome Structure of the Influenza Virus at Various Levels of Attenuation." Data were presented on the oligonucleotide mapping of individual genes of passage variants of the epidemic influenza A/Leningrad/337/76 (H3N2) virus strain that differ in degree of attenuation. Changes in the structure of only two low-molecular genes that code matrix and non-structural proteins were detected in the attenuation process. The study concluded that there was a correlation between M- and NS-gene functions and attenuation of the influenza virus under investigation.

V. D. Smirnov (USSR). "Chemical-Enzymatic Synthesis and Expression of Polynucleotides that Code Antigen Determinants of HB<sub>S</sub>-Ag." Results are presented for experiments undertaken for the ultimate purpose of working out approaches to making "pure" vaccines. Data on the primary structure of the HB<sub>S</sub> protein and the localization of antigen determinants on the protein were used to synthesize polynucleotides that code two antigen determinants of HB<sub>S</sub> (from 93 to 109 and from 135 to 151 amino acid remnant). The first series has already been incorporated into a bacterial plasmid and into the structural gene segment of the chloramphenicol-transferase protein carrier. The synthesis of a polypeptide which corresponds in molecular mass to the expected hybrid protein was observed to take place under the control of this plasmid in an in vitro transcription-translation system.

E. Ya. Gren (USSR). "Cloning and Expression of a Hepatitis B Virus Gene." The paper dealt with the cloning of a hepatitis B virus genome and a study of expressing viral genes in a bacterial cell. The expressed gene is that of the HB<sub>S</sub> antigen which is the most important one from the viewpoint of making antiviral vaccines. Genetic engineering manipulations were employed to place the gene under the control of various bacterial promotors. Then, the sector which codes the N-end section of the viral protein was removed. Expression of the HB<sub>S</sub> antigen in E. coli induced the suppression of culture growth. A rapid elimination or inactivation of the HB<sub>S</sub> antigen gene was observed whereby the cells in which the expression of the HB<sub>S</sub> protein in the population was halted by one method or other, displaced the producer-cells. The most pronounced expression was observed when the HB<sub>S</sub> gene which was deprived of the sector that controls the 22 amino acid remnants of the N-end section of the HB<sub>S</sub>-gene, was expressed under the control of tryptophan scanning.

#### Section on Oncogenic Viruses and Interferon

G. P. Georgiyev (USSR). "Jumping Genes of Animal Cells and Their Possible Role in Evolution and Carcinogenesis." The speaker reported on the principal results obtained from studies in his laboratory on mobile, dispersed genes and short B-type series that are often repeated in a genome which are probably also

mobile elements of a genome. A study of these elements has shown that they are capable of markedly changing the expression of genome sectors into whose regions they are introduced. Therefore, changes in their position may markedly accelerate the rate of the evolutionary process. On the other hand, they might lead to a disruption of normal cellular processes, and, in particular, to a cancerous conversion of cells.

M. A. Shlyankevich (USSR). "The Role of Early SV40 Proteins." Results are given that were obtained by the use of a new methodological approach which entails the introduction of a highly purified "early" protein of SV40 (T-antigen) into cells with the aid of a liposome. The T-antigen effectively penetrated cells of variable species classification and was concentrated in the nucleus. A marked increase in the number of DNA-synthesizing cells was observed under serum starvation conditions. Also noted was a repeated increase in the number of chromosome aberrations. The specificity of the effects was confirmed by the fact that the specific removal of the T-antigen from the liposome preparations with the aid of an immunosorbent eliminated the indicated effects. The combination of capabilities to accomplish different functions in a single protein-T-antigen allows one to explain the diversity and multi-stage nature of the processes that occur in cells during carcinogenesis induced by papovaviruses.

S. N. Khil'ko (USSR). "Hexone of Adenoviruses: Structure, Mutability, and Antigen Determinants." Both highly conservative and hypervariable sectors are contained in the structure of adenovirus hexone. A well-defined correlation between the trimeric structure and antigen activity of hexone was demonstrated. Proteolysis of hexone trimers of monkey type 7 adenovirus by trypsin-chymotrypsin splits it into three to seven fragments only. The fragments are held within the structures that are close to the original trimers, and are activated by species- and genus-specific antibodies. The denatured fragments as well as the denatured hexone are completely devoid of antigen activity. Antigen activity is presumed to exist in individual determinants within the structure of small peptides that are formed during the complete hydrolysis by chymotrypsin. The structure of hexone and the prospects of making vaccines from its fragments by genetic engineering methods were discussed.

V. Vonka (CSSR). "Nuclear Antigen of the Epstein-Barr Virus." Literature data and research results obtained from the speaker's laboratory on the immunology, biochemistry, and biology of the nuclear viral antigen are reviewed. The antigen was clearly shown to be a non-structured protein coded by a viral genome which probably plays an important role in the interaction between virus and cell, although the details of that mechanism are not yet clear.

F. P. Filatov (USSR). "Building Complete Libraries of Genome Fragments of Simple Types 1 and 2 Herpes Virus (VPG1 and VPG2)." The plasmid pBR322 is used to clone small Hind-III-fragments of the simple herpes virus (VPG2) genome (up to 6.3 megadaltons) that comprise ~10 percent of the genome. Fragments of VPG-1 that comprise ~40 percent of the viral genome were cloned with the aid of Garom [?] 4A-EcoR I phage, and products of partial EcoR I-hydrolysis of DNA of VPG-1 and VPG-2 that contain practically all sequences of viral genomes were cloned with the aid of the cosmid pHCT9.

R. A. Gibadulin (USSR). "Production of TK-mutants of the Simple Type 1 (VPG-1) Herpes Virus by Recombination with a Cloned, Inactivated Gene of VPG-2 Thymidine Kinase." In the course of experiments, a TK-gene of VPG-2 which had been cloned earlier within the structure of a hybrid plasmid was dissected by means of inserting a DNA fragment of a rat ribosome operon. The hybrid plasmid produced in this manner was injected together with DNA from VPG-1 into Vero cells and released clones of VPG-1 that were resistant to thyminearabinoside and bromodesoxyuridine. No variants containing a ribosome operon were detected among the cloned viruses. However, two mutants carrying a deletion of 0.3 megadaltons in the TK-gene region were separated which is possibly indicative of a specific interaction between the TK-gene of VPG-2 and the corresponding region of the VPG-1 genome.

S. A. Tsarev (USSR). "The Production and Properties of Human Interferon from Bacteria." Results were presented for the genetic engineering production and expression of hybrid plasmids in bacteria that carry the  $\alpha$ -F gene of human interferon and the synthetically constructed  $\alpha$ -F/A and  $\alpha$ -F/D hybrid genes. Data were given on the primary structure of these genes.  $\alpha$ -F was much more effectively expressed under the control of a tryptophan promotor than under the control of even a tandem of lac UV5. This is probably associated with the involvement of mRNA translation in the pin of the initiation site in the second case. The amount of  $\alpha$ -F that was produced under the control of tryptophan promotor came to 1 mg per liter of culture.  $\alpha$ -F/D was produced in approximately the same manner. The interferons synthesized in bacteria were similar to the natural leucocytic interferons with respect to immunological properties, spectrum of antiviral action and kinetics of the cells' development of viral resistance and stability. The synthesized interferons differed significantly from  $\beta$ - and  $\gamma$ -interferons, however (see the following report). Methods were worked out to purify the natural and "recombinant" interferons practically to the homogenous state.

A. S. Novokhatkiy (USSR). "Comparison of Biological Properties of Plasmid and Leucocytic Human Interferon." Results were presented of joint research that was completed, as was the foregoing study, by associates at the USSR Academy of Medical Sciences Institute of Virology imeni D. I. Ivanovskiy, the USSR Academy of Sciences Institute of Bioorganic Chemistry im. M. M. Shemyakin, and the USSR Academy of Medical Sciences Institute of Epidemiology and Microbiology imeni N. F. Gamaleya. The biological properties of "recombinant" interferons (RI) which were mentioned in the previous report were discussed in detail. As a whole, the properties of RI repeat the properties of the natural alpha-interferons. However, RI, especially  $\alpha$ -F/D, have a significantly broader spectrum of antiviral activity than the natural interferons. Four clones of cells were produced that actively produce monoclonal antibodies to human  $\alpha$ -interferon that have already been multiplying steadily over a period of ten passages. The antibody derivatives were shown to be suitable for the effective purification of RI which opens up real prospects for producing and purifying RI for broad clinical use.

F. I. Yershov (USSR). "Molecular Mechanisms for the Action of Double-Helix Interferon Inductors." An attempt was undertaken to explain the connection between the biological effects induced by double-helix RNA (dRNA) and protein kinase which blocks the translation initiation factor eIF-2 and thereby

suppresses translation. It has been known that in a non-cellular system of translation from rabbit reticulocytes, dhRNA activates protein kinase whose inhibiting effect can be removed by the addition of eIF-2. It has been demonstrated that L<sub>299</sub> cells processed by dhRNA doubles the suppression of protein synthesis efficiency in those cells. This may be connected with protein kinase. The administration of dhRNA to rabbits induced the formation of interferon, but did not affect the synthesis of protein in lysates of reticulocytes that were obtained from these rabbits. Consequently, the in vitro administration of dhRNA externally does not activate protein kinase. However, the formation of replicative forms of RNA in viral infections in cells should activate this inhibitor.

I. Beladi (Hungarian People's Republic). "Molecular Aspects of the Adenoviral Induction of Interferon." Data currently available on the mechanism underlying the induction of interferon by adenoviruses, i.e., DNA-containing viruses, were reviewed. According to data obtained in the speaker's laboratory, adenoviruses can be grouped into strong and weak inductors of interferon in chick embryo fibroblasts. The interferon-inducing activity of the strong inductors is sensitive to UV-irradiation, while the weak inductors are not. Defective particles that contain 20 percent and more of the left section of a genome were also shown to possess inductive activity, but empty capsids did not. Consequently, the left segment of a virus genome is essential and sufficient for initiating the mechanism of interferon production.

M. Novak (CSSR). "The Role of Gamma-Interferon and Interleukin-2 in the Proliferative Activity of Lymphocytes." The presynthesis of interleukin-2 is essential to the production of gamma-interferon subsequent to the mitogenome Kon A processing of lymphocytes from mouse spleen. Despite the fact that gamma-interferon is produced by cells with antigens with a Lyt 2<sup>+</sup> phenotype, the presence of T-lymphocytes with phenotype Lyt 1<sup>+</sup>2 is required for its maximum production.

The symposium took place on a high scientific level which demonstrated the aspiration of Soviet and foreign scientists for closer cooperation to enable them to clarify problems that have not as yet been resolved.

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PROSPECTS FOR PRACTICAL USE AND CERTAIN FUNDAMENTAL STUDIES OF SMALL REGULATORY PEPTIDES

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 30, No 3, May-Jun 84 pp 2-7

ASHMARIN, I. P.

[Abstract] The regulatory peptide system has been found to be one of the most important regulatory systems in the body. The number of natural regulatory peptides isolated and identified today is almost 100, the number of RP synthesized is in the thousands. However their use is limited by: 1) the impossibility or difficulty of oral administration; 2) the relatively rapid rate of breakdown after administration; 3) the difficulty in passing through the blood-brain barrier; 4) the modulating nature of their action, frequently strongest with deviations of the state of the body from normal; 5) the continuing determination of new important side effects; and 6) the appearance of long-term secondary effects. This article discusses the possibilities and successes achieved in overcoming these difficulties. In general, many synthetic small regulatory peptides are presently being introduced into practice in spite of the difficulties enumerated. Clinical studies are underway in the USSR for vasopressins, dalargin, an enkephalin analog with antiulcer action, rифотироин (thyreoliberin), an antiparkinson and antidepressant drug, teprobid, which influences the formation of a гiotension, certain summary fractions of thymus peptides which act as immunomodulators and oxytocin, a neuroleptic.

References 37: 24 Russian, 13 Western.

[1539-6508]

UDC 612.433.018:577.175.3+612.822.018:577.175.82]:577.212.3

BIOLOGICALLY ACTIVE HORMONE PROTEIN FRAGMENTS

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 30, No 3, May-Jun 84 pp 8-15

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[Abstract] Analyses performed at the authors' institute have demonstrated that corticotropin-like and opiate hormones are synthesized as high molecular weight protein precursors and are biologically active fragments of them. These fragments can in principle be considered not only individual hormones but as

components of one and the same hormone, having a broad spectrum of biological activity. Each of the fragments corresponds to but a single type of activity of the initial protein. Other peptide hormones are synthesized similarly. The secretion of somatotropin by the hypophysis as a large molecular protein does not exclude the possibility of its enzymatic modification as it performs peripheral physiological functions, where somatotropin may break down into individual fragments responsible for various types of the biological activity of the initial hormone. To study this problem, a model of the lipotropic effect of somatotropin was selected, since it is easily reproduced in vitro. The study of the biological activity of retro-enkephalins in the Laboratory of Biological Standardization of Hormones of the institute has shown that retro-methionin-5-enkephalin and retro-leucine-5-enkephalin when subcutaneously administered to rats have the ability to stimulate the secretion of prolactin in the hypothalamus. These effects are moderated through the hypothalamus, since none of these compounds cause stimulation of prolactin secretion upon direct contact with cultivated adenohypophysis cells. The institute has also developed an original plan for synthesis of thyroliberin H-Pyr-His-Pro-NH<sub>2</sub> and its analogs. The synthetic tripeptides studied include thyroliberin analogs with substituents of the second and third positions, including three groups of compounds with varying levels of activity. After full experimental and clinical studies synthetic thyroliberin has been approved by the USSR Ministry of Health for medical use as a means of differential diagnosis of conditions related to hypothalamus-hypophysis system disorders. References 32: 15 Russian, 17 Western.

[1539-6508]

UDC 615.276.4:577.112.853

#### NEW PEPTIDE-PROTEIN IMMUNOSTIMULANTS

Moscow VOPROSY MEDITSINSKOY KHMII in Russian Vol 30, No 3, May-Jun 84 pp 37-43

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[Abstract] Results obtained in recent years in studies of the spatial structure and functional organization of peptide-protein substances indicate the exceptional role of electrostatic interactions in determination of the spatial structure and molecular mechanisms of these compounds. Theoretical semi-empirical calculation of spatial structures of peptides containing common fragments has shown that their structures are not linear but quasicyclic. The regularities of formation and fixation of quasicyclic ligand structures allow a priori location of new potentially active sections in the molecules of peptides and proteins. Formation of quasicyclic structures in processes of ligand-receptor interaction after dehydration of ionogenic groups can also be postulated in the case of formation of enzyme-substrate complexes. The most characteristic structural element of the common fragments of peptides in proteins is the nucleus, forming the main amino acid or amide aminodicarboxylic acid located with one or more segments of proline or valine. Biosynthetic reactions performed by the authors serve as the basis of many regulatory processes of cells and of the body. In a relatively narrow region of the

peptide chain at least 4 different active centers are concentrated determining the widely varied functions of the IgG molecule. Development of quasicyclic substances stabilized by intramolecular bonds of various types is the universal principle in the functioning of these natural ligands. Figures 6; references 25: 7 Russian, 18 Western.

[1539-6508]

UDC 577.175.82+612.82.014.46:577.175.82

#### ENDOGENOUS NEUROPEPTIDES AS SPECIFIC CENTRAL NERVOUS SYSTEM FUNCTION MODULATORS

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 30, No 3, May-Jun 84  
pp 43-46

VARMANYAN, G. A., KLEMENT'YEV, B. I. and PETROV, Ye. S., Department of Physiology imeni I. P. Pavlov of the Scientific Research Institute of Experimental Medicine, USSR Academy of Medical Sciences, Leningrad

[Abstract] Neuropeptides can induce functional CNS restructuring at various levels in experiments. The prospect for creation of the basically new approach to the solution of the problem of directed regulation of CNS activity under normal conditions and correction of damaged CNS functions in pathology by the use of endogenous neurohumoral peptide factors is quite promising. The development of this approach requires study of a number of problems including identification of neurohumoral factors specific for modulation of various CNS functions; extraction of these factors in pure form and study of their chemical nature; analysis of the mechanism of action and significance of this type of bioregulator in the functioning of the nervous system. The purpose of this report is to sum up experimental studies performed on these problems in the author's institute. It is concluded that the principle of the CNS activity by endogenous neurohumoral peptide factors is universal in the sense that it is implemented in the organization of reactions of various degrees of complexity including intercenter restructuring in conditioned reflex activity and compensatory processes caused by organic brain tissue damage. This principle of regulation is evolutionarily ancient. References 8: 7 Russian, 1 Western.  
[1539-6508]

PHARMACOLOGY AND TOXICOLOGY

UDC 615.214.24.07

STUDY OF HYPNOGENIC ACTIVITY OF DELTA-SLEEP-INDUCING PEPTIDE AND ITS STRUCTURAL ANALOGS

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 47, No 3, May-Jun 84 (manuscript received 31 Oct 83) pp 26-30

[Article by R. N. Alyautdin, V. N. Kalikhevich and V. I. Churkina, Department of Pharmacology (chairman -- D. A. Kharkevich, corresponding member of the USSR Academy of Medical Sciences) of the First Moscow Medical Institute imeni I. M. Sechenov; Department of Chemistry of Natural Compounds (chairman -- Professor V. F. Martynov) of the Leningrad University imeni A. A. Zhdanov]

[Text] In recent years, reports were published on the isolation of several oligopeptides inducing changes in the behavior of animals and the electrical activity of the brain characteristic of slow-wave orthodox sleep. Pappenheimer et al (1967) discovered such properties in oligopeptide of a 500-dalton mass obtained from the cerebrospinal fluid of a female goat. This compound caused the appearance of signs of sleep when it was administered to cats and rats. In the experiments conducted by Nagasaki et al. (1980), sleep was prolonged in mice which were administered an extract from the tissues of the cerebral trunk of animals deprived of sleep. In their opinion, the extract from brain tissues contains a sleep-inducing substance. Pavel et al. (1977) gave data on a very high hypnogenic activity of the arginine-vasotocin peptide. The delta sleep inducing nanopeptide (DSIP<sup>1</sup>) is known most widely. It was isolated and then synthesized by Monnier et al. (1973; 1977). Oligopeptide obtained from the cerebrospinal fluid and its synthetic analog cause slow-wave sleep in rabbits when it is introduced into the ventricles of the brain, as well as intravenously. In studying the properties of DSIP, a number of authors obtained results similar to those obtained by Monnier (V. I. Medvedev and V. D. Bakharov, 1979; I. G. Karmanova et al., 1979). At the same time, V. M. Koval'zon and V. A. Tsibul'skiy (1980), Yehuda et al.,(1980), Borbely and Tobler (1980) did not confirm the hypnogenic properties of DSIP. At the present time, a search for active compounds is conducted among DSIP derivatives and metabolites. Studies in sleep-inducing properties of DSIP metabolites and analogs with replacement of amino acids in the third position with Arg and in the fifth position with Tyr or Gly did not reveal any active compounds.

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1 2 3 4 5 6 7 8 9

1. DSIP -- delta-sleep-inducing peptide (Trp-Ala-Gly-Gly-Asp-Ala-Ser-Gly-Glu).

The purpose of this study was to investigate the hypnogenic properties of a synthetic DSIP peptide and its effect on the components of the EEG. Along with this, the properties of 22 new DSIP derivatives were evaluated.

**Study Methods.** Experiments were conducted on rabbits. First, the animals were narcotized (nembutal 40 mg/kg) and, with additional infiltration of soft tissues of the head with 1% solution of novocain, cannulas were inserted into the lateral ventricle of the brain (AP+2.5; L -- 7; H -- 1 according to Fivkov and Marshal Atlas) or into the aqueduct of Sylvius (AP+10.5; L -- 0; H -- 0) for the introduction of the compounds being studied. For recording the EEG, electrodes were introduced epidurally to the parietal or the occipital region. An indifferent electrode was secured in the bones of the nose. The scalped surface of the skull was covered with a tooth cement. The experiments were started 7-9 days after the operation. First, animals were adapted to the conditions of the experiment: they were placed daily into the chambers where studies were conducted, and manipulations imitating the introduction of the preparation were performed. Experiments were started at the same time: at 11-12 noon. The EEG was recorded with the aid of an "Alvar" electroencephalograph, and the quantitative evaluation of the waves in the EEG spectrum was done on an MAF-5 integrator. The integrator calculated the areas of alpha-waves (8-13 Hz),  $\beta_1$ -waves (13-20 Hz),  $\beta_2$ -waves (20-30 Hz),  $\theta$ -waves (4-8 Hz) and  $\delta$ -waves (2-4 Hz) during time intervals of 20 s. The EEG was evaluated before and after the introduction of the preparations; the number of waves before the introduction of the substance was taken to be 100%. DSIP and its analogs were administered into the ventricles of the brain in the amount of 40-200  $\mu$ g in 50  $\mu$ l of a physiologic salt solution in the course of 1 min. The EEG was recorded simultaneously in two animals. Changes observed in both rabbits simultaneously were considered to be reliable (Figure 1).

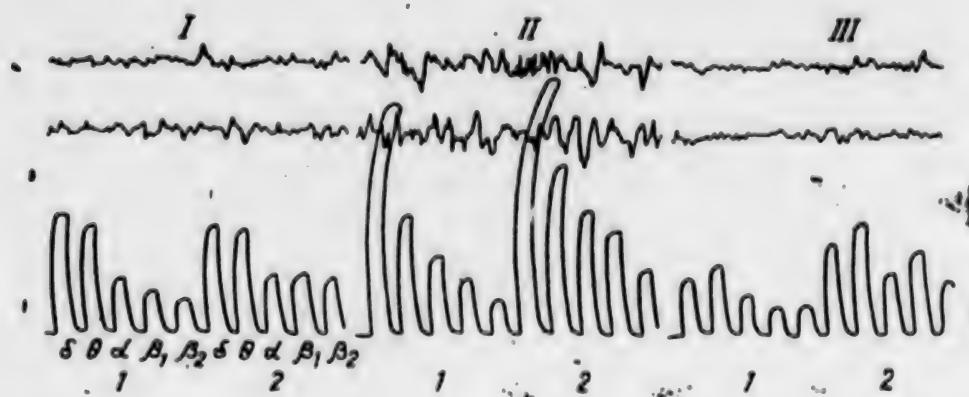


Figure 1. Changes in the EEG during the administration of DSIP to two rabbits (1 and 2) simultaneously. I -- initial background; II -- 20 minutes after the administration of DSIP (60  $\mu$ g into the ventricles of the brain); III -- one minute after awakening. Below -- readings of the integrator for animals 1 and 2; Greek letters designate EEG waves.

In synthesizing structural analogs of the DSIP, the nanopeptides in all of the nine positions of the amino-acid sequence were replaced with amino acids which

occur most frequently in neuroactive peptides (see table). Along with this, analogs were obtained with an elongated (XIX) and shortened (XXI-XXIII) chain, a di-substituted analog (XVIII) and an analog with a retrosequence (IX). In order to increase the stability to the effects of proteases, analogs were synthesized where L-amino acids were substituted with corresponding D-amino acids.

**Results and Discussions.** It was observed that during the first 5-10 minutes after the administration of DSIP, the rabbits showed an increase in their motor activity and the orientation reaction: the animals stood up on their hind paws, tried to look out of the chamber, and sniffed the space around them. Masticatory and face-washing motions were noted in some animals. Then the animals calmed down and assumed a position characteristic of sleep: the head was lowered, and the eyelids were almost closed. At that time, the EEG showed "sleep spindles" and single  $\delta$ -waves, whose number was constantly increasing, reached the maximum by 15-20 min, being 230% in relation to the initial level (Figure 2). Sleep which developed after the administration of DSIP was interrupted by loud sounds and by touching the animals. During their sleep, the animals did not assume a lateral position, although they sometimes would lie down on the floor of the chamber.

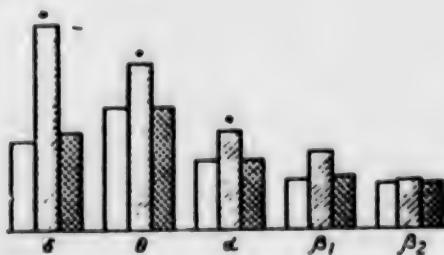


Figure 2. Effect of DSIP on the spectral composition of the EEG ( $\delta$ -,  $\theta$ -,  $\alpha$ -,  $\beta_1$ , and  $\beta_2$ - wave) of a rabbit. White columns -- initial background, shaded with slanting lines -- 20 min after the introduction of DSIP into the brain ventricles (60  $\mu$ g), with cross-line shading -- after awakening, stars -- statistically significant differences ( $P \leq 0.05$ ) from the initial background.

Along with the increase in the number of  $\delta$ -waves, there was an increase in the total area of  $\theta$ -waves by 36% and  $\alpha$ -waves by 40% (see Figure 2). The EEG was not uniform during their sleep: there were mainly slow waves, i.e.,  $\delta$ - and  $\theta$ - rhythm, however, episodes of EEG desynchronization were also observed, which occurred more frequently during the time the animals were falling asleep and before their awakening. At that time, the animals performed masticatory motions, woke up for 1-2 min, and then fell asleep again. The total time of sleep was 55-65 min. Upon awakening, the spectral composition of the EEG and the behavior of the animals did not differ from the initial level. Awakening was considered to be a purposeful action of the animals, most frequently the taking of food. The above changes were noted when the peptide was administered in a dose of 60  $\mu$ g. Increasing the dose did not lead to any increase in the number of  $\delta$ -waves in the EEG or to the lengthening of the time of sleep.

## Activity and Hypnogenic Properties of DSIP and Its Structural Analogs

Analogs (1)	Effective dose (2)	Drowsiness time, min (3)	Latency period (4)	Promotion of sleep reaction (5)
I Trp Ala Gly Asp Ala Ser Gly Glu	60	55—65 10—15	7—10 20	OP, orientation reaction (12) OR, orientation (13)
II DSIP [DTrp] Phe <sup>a</sup>	60	Короткие эпизоды сна в течение (6) 50 мин*	—	—
III DSIP DPh <sup>b</sup>	40	65—75 10—15	10—16 3	Длительная OR (14) Усиление
IV DSIP Phe(NO <sub>2</sub> ) <sup>c</sup>	100	20	—	—
V DSIP Tyr <sup>d</sup>	80	Короткие эпизоды сна в течение (7) 20 мин*	—	Засыпание в нудильной поse (16)
VI DSIP DTY <sup>e</sup>	80	Короткие эпизоды сна в течение (8) 45—50 мин*	3	—
VII DSIP [DAle] <sup>f</sup>	200	—	—	—
VIII DSIP retro	200	—	—	—
X DSIP [Gln] <sup>g</sup>	200	—	—	OP в течение 6 мин (17)
XI DSIP [Asn] <sup>h</sup>	200	—	—	—
XII DSIP [Glu] <sup>i</sup>	200	—	—	—
XIII DSIP Pro <sup>j</sup>	200	—	—	—
XIV DSIP [Leu] <sup>k</sup>	200	—	—	—
XV DSIP [Thr] <sup>l</sup>	200	—	—	OP в течение 10 мин (18)
XVI DSIP [DAle] <sup>m</sup>	200	—	—	—
XVII DSIP [DAle] <sup>n</sup>	200	40—50	30—40	Усиление в течение 15—20 мин (19)
XVIII DSIP [DAle] <sup>o</sup> , [DAle] <sup>p</sup>	80	Короткие эпизоды сна в течение 30 мин*	3	—
XIX DSIP—Tyr	100	(9)	15	—
XX DSIP [Gly] <sup>q</sup>	80	Короткие эпизоды сна в течение 45 мин* (10)	—	OP в течение 10 мин (18)
XXI Gly—Gly—Asp—Ala—Ser—Gly—Gly	80	Эпизоды сна в течение 25 мин* (11)	8—10 3—5	Длительное возбуждение (20)
XXII DAle—Gly—Asp—Ala—Ser—Gly—Gly	200	—	—	—
XXIII Phe—Ala—Gly—Gly—Asp—Ala	200	—	—	—

Note: OR -- orientation reaction; asterisks show that episodes of sleep were not observed simultaneously in rabbits.

Key: 1. Analog

2. Effective dose,  $\mu\text{g}$

3. Length of sleep, min

4. Latent period, min

5. Reactions preceding

sleep

6. Short episodes of sleep in the course of 25 min\*

7. Short episodes of sleep in the course of 20 min\*

8. Short episodes of sleep in the course of 45—50 min\*

9. Short episodes of sleep in the course of 30 min\*

10. Short episodes of sleep in the course of 45 min\*

11. Episodes of sleep in the course of 25 min\*

12. OR, licking, face washing

13. OR, face washing

14. Long OR

15. Face-washing

16. Peering in an uncomfortable position

17. OR in the course of 5 min

18. OR in the course of 10 min

19. Face-washing in the course of 15—20 min

20. Motor excitation

Studies on the hypnogenic properties of DSIP analogs showed differences in their activity. Analog IV was more active than the DSIP, while the remaining compounds were either inferior to the sleep-inducing peptide with respect to their activity, or had no sleep-inducing effect at all (see table). Activity pronounced to one or another degree was observed in compounds where amino acids were substituted in the end positions of the molecule with DTrp<sup>1</sup>, DPhel<sup>1</sup>, Phe (NO<sub>2</sub>)<sup>1</sup>, Tyr<sup>1</sup>, Gly<sup>9</sup> (II-VII, XX), while substitution in the middle of the molecule resulted in a sharp decrease or loss of activity.

Differences in the effect of the studied peptides were not only in their activity, but also in the length of the effect. For example, analogs IV and XVIII are comparable with the DSIP with respect to the length of the induced sleep. They induced sleep in the course of 45-50 minutes, while the remaining active compounds had a shorter effect. Two of the compounds (II and XVIII) are characterized by a long latent period exceeding that of the DSIP. It was noticed that some compounds which had no hypnogenic activity (XI, XV) or had weak sleep-induced properties (V, XXI) caused a long reaction preceding sleep (orientation reaction, face-washing).

The occurrence of slow wave sleep after the administration of DSIP was described by a number of authors (I. G. Karmanova et al., 1979; Monnier et al., 1973). At the same time, the length of this sleep, according to the data of various investigators, varies from one hour (I. G. Karmanova et al., 1979) to six hours (Monnier et al., 1977). These differences could be due to different methods of the administration of the preparation, experimental conditions and criteria of the termination of the sleep-inducing effect.

Studies of the hypnogenic activity in a number of DSIP analogs revealed considerable differences in the properties of individual compounds. Compounds with substitutions in the end amino acids (II-VII, XX) had sleep-inducing activity, while substitutions in the middle of the molecule led to the loss of activity. Schoenenberger and Monnier (1977) studied the properties of DSIP metabolites and several di-substituted derivatives in which substituting was done in the third position with Arg and in the fifth position with Tyr or Gly. None of the studied compounds showed sleep-inducing properties.

No interrelation between the degree of expression of the reaction preceding sleep and the sleep-inducing activity was observed for DSIP derivatives. For example, some compounds were characterized by sleep without any preceding stimulation, while for others, on the contrary, no appearance of signs of sleep was registered after stimulation. It is possible to assume that, although the above behavioral reactions are links of the same chain, their appearance is connected with effects on different structures. Consequently, compounds may differ with respect to their affinity with one or another structure.

It was not possible to obtain unambiguous data on the role of the substitution of L-amino acids with dextrorotatory isomers. For example, compound IV containing DPhel<sup>1</sup> has a considerably longer effect than compound III with LPhel<sup>1</sup>. Substitution of LTrp<sup>1</sup> by DTrp<sup>1</sup> in the DSIP molecule led to a decrease in activity. Analogs VI and VII containing respectively LTyr<sup>1</sup> and DTyr<sup>1</sup> had similar properties.

Thus, among the 22 DSIP analogs that were studied, compound IV with DPhe in the first position has a higher activity than the DSIP peptide. The remaining compounds are either inferior to DSIP with respect to their hypnogenic activity, or do not have it at all.

#### Conclusions

1. The delta-sleep-inducing peptide (DSIP) and a number of its analogs (II, IV, V, XVIII and XX), when introduced into the ventricles of the brain, induce sleep closely resembling physiological sleep. According to the EEG data and behavioral reactions, no signs of aftereffects occur in the animals upon their awakening.
2. Analog IV containing DPhe in the first position has a higher activity than DSIP.

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10233  
CSO: 1840/1580

UDC 579.842.23:579.253].083.12

ISOLATION, PURIFICATION AND SOME PHYSIOCOCHEMICAL PROPERTIES OF PESTICIN I  
OBTAINED FROM YERSINIA PESTIS STRAIN EU

Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 6,  
Jun 84 (manuscript received 14 Jun 83) pp 41-44

[Article by Ye. K. Goncharov, I. V. Suchkov, and B. N. Mishan'kin, Rostov Scientific Research Antiplague Institute, USSR Ministry of Health]

[Text] The pesticin-formation character is one of the recognized determinants of the virulence of *Y. pestis* [2]. In spite of its extrachromosomal localization [3, 5], the frequency of occurrence of pesticin I in wild strains is very high, which makes it possible to consider it along with fraction I of *Y. pestis* as a convenient marker for testing the agent. However, the biological methods used at the present time for the determination of pesticin are cumbersome and labor-consuming, which is a serious obstacle for a wide use of the pesticin test in plague examinations. In this connection, it is of interest to obtain a pure pesticin preparation and an antiserum for it for subsequent development of serological pesticin tests.

The purpose of this work was to isolate, purify and study certain properties of pesticin I from *Y. pestis* cells.

**Materials and Methods.** The strain *Y. pestis* EU76 was used as the producer of pesticin I. Cells were grown with intensive aeration at 28 degrees C in the LB broth. For the induction of pesticin I to a grown culture which was in a late logarithmic phase of growth, mytomycin C was added to a concentration of 0.2  $\mu$ g/ml. Incubation was continued for another 12 hours. Cells were precipitated by centrifuging at 6000 rpm in a J 21C "Beckman" centrifuge (rotor JA 10).

Pesticin was isolated and purified at 4 degrees C with the use of the equipment of the firm LKB (Sweden). Pesticin was extracted three times from the cells with intensive mixing with a 0.1 M potassium-phosphate buffer of pH 6.8 with 1 M of NaCl in the course of 30 minutes. Proteins were salted out with a saturated solution of ammonium sulfate brought to pH 7.8 with an aqueous solution of ammonium. Fractionation on ultragel AcA44 (LKB) was done on a 2.5x100 cm column balanced with a 0.005 M tris-HCl-buffer of pH 7.8 (buffer A) at a rate of 30-35 ml/h. Chromatography on DE-52-cellulose (Whatman) was done on a 2.5x10 cm column balanced by buffer A at a rate of 15 ml/h. Protein elution was accomplished with a buffer with a linear gradient of NaCl of up to 0.5 M. In hydroxylapatite chromatography (Bio Gel HTR, Bio Rod), proteins were separated on a 1.5x10 cm

column with the aid of a 0.01-0.5 M gradient of a potassium-phosphate buffer of pH 6.8.

The isoelectrofocussing of proteins on ampholines was carried out in an LKB column in a saccharose gradient at an ampholine concentration of 1% with a pH range of 4.0-7.0. Electrofocussing was done in accordance with the recommendations of the firm. After completing the focussing, 2 ml of the fraction were collected in each case and the pH values were registered on an OR-208 pH-meter (Hungary) with a universal electrode. The protein was determined by the Ehresmann method [4].

The activity of pesticin was determined by the method of delayed antagonism according to Fredericq [6], using a universal indicator strain  $\phi$  of *Bacillus coli* as an indicator. Specific activity was calculated by the maximum dilution of the preparation which gave an expressed inhibition zone of the growth of the indicator strain converted to 1 mg of protein.

Electrophoretic studies of proteins in a polyacrylamide gel were conducted according to Laemmli's method [8], using a mixture of standard proteins as markers (Boehringer). The molecular mass of pesticin was calculated also with consideration of the mobility of proteins in gels of different polyacrylamide concentrations according to Buzun [1].

The amino-acid composition of the pesticin preparation was determined on a "Hitachi" analyser, model KLA (Japan). The hydrolysis of proteins was conducted according to the Moore and Stein method [9].

The antipesticin serum was obtained by immunizing rabbits with purified pesticin preparations. The immunization cycle included eight intramuscular injections of 1 mg of protein each on a complete Freund's adjuvant with a one-week interval. The animals were exsanguinated on the tenth day after the last injection. In the Ouchterlony precipitation test in gel, in addition to the rabbit antipesticin serums, we used commercial agglutinating plague serums of the series 109, 714, 283, 266, 6, and 133 produced by the Saratov and Irkutsk Scientific Research Antiplague Institutes. The results of precipitation were finally assessed ten days after incubation at 37 degrees C.

**Results and Discussions.** In order to obtain the material for bactericin purification, we used 16 l of a broth culture of the EV strain induced by mitomycin C. The results of studies indicated that the content of cell-free pesticin in the culture fluid was relatively low, which made it possible to disregard it. When cells are destroyed in an X-press, the extract usually contains considerable amounts of admixtures of proteins and nucleic acids, which complicates the purification procedure of pesticin. In this connection, we used the salt extraction method. After the extraction of cells, 100 ml of a crude extract were obtained with a specific activity of  $2.5 \times 10^5$  units per 1 mg of protein, which was salted out with ammonia sulfate within a range of 35-65 % of saturation. The precipitate was dissolved in 100 ml of buffer A and concentrated in the "Amicon" system (Holland) with the aid of a pM10 filter to 10 ml, which made it possible to obtain simultaneously a protein concentrate with a low content of ammonia sulfate. Further purification was conducted by means of gel-filtration on ultragel AcA44. The elution profile is shown in Figure 1,a. Fractions with pesticin activity were

combined and were deposited on a column with DE-52-cellulose. After removing unsorbed proteins from the ions exchanger by washing with buffer A, the desorption of proteins was carried out by a linear gradient of NaCl to 0.5 M. Pesticin activity was observed in samples with an NaCl concentration of 0.01-0.03 M (Figure 1,b). These fractions were combined and subjected to chromatography on hydroxylapatite. At this stage of purification, pesticin I was divided into two active fractions corresponding to alpha- and beta-forms according to Brubaker (Figure 1,c) [7]. Purification of pesticin was concluded by repeated filtration on AcA44 gel with the use of a 0.1 M potassium-phosphate buffer of pH 6.8 as a balancing buffer.

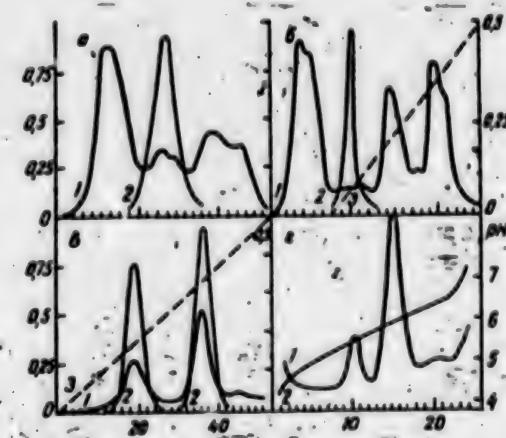


Figure 1. Purification of pesticin I from EV strains of *Y. pestis* by the methods of column chromatography and isoelectrofocusing on ampholines. a -- ultragel AcA44: 1 -- relative optical density at 280 nm; 2 -- pesticin activity (in standard units); b -- DE-52-cellulose chromatography: 1 -- relative optical density at 280 nm; 2 -- pesticin activity (in standard units), 3 -- NaCl gradient; c -- hydroxylapatite chromatography; 1 -- relative optical density at 280 nm, 2 -- pesticin activity (in standard units), 3 -- gradient of potassium-phosphate buffer; d -- isoelectrofocusing on ampholines: 1 -- relative optical density at 280 nm, 2 -- pH gradient. Along the X-axis -- numbers of fractions; along the Y-axis: to the left -- optical density at 280 nm ( $A_{2280}$ ), to the right -- NaCl molarity.

The preparation of pesticin I purified according to the above scheme was kept for over 10 months at 4 degrees C under a 65%-solution of ammonia sulfate without any obvious loss of activity. It was found that the preparation of pesticin I was represented by three forms: alpha, beta, and gamma which were clearly separated during the electrofocusing on ampholines due to their different isoelectric points equal to 5.49, 5.88 and 6.21, respectively (Figure 1,d). However, in the precipitation reaction with plague agglutinating serums, these forms of pesticin formed one closed line. The rabbit antipesticin serum obtained for the preparation of the beta-form also produced one line with alpha-and gamma-forms of pesticin I (Figure 2). These results indicate the homogeneity and immunological identity of the obtained forms of the pesticin preparation.

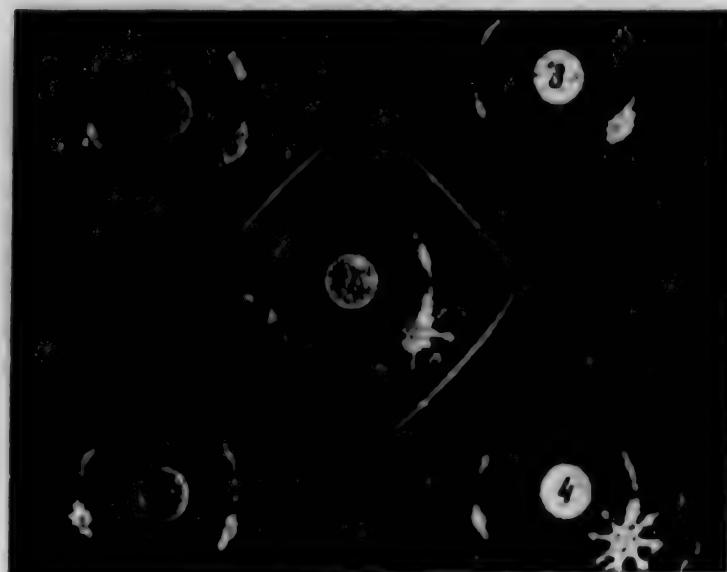


Figure 2. Diffusion Precipitation Test in Gel.

1-- antipesticin rabbit serum for the beta form pesticin I preparation; 2 -- pesticin I, alpha-form; 3 -- pesticin I, beta-form; 4 -- pesticin I, gamma-form; 5 -- extract from cells of EV strain of *Y. pestis*.

By electrophoretic analysis of the pesticin preparation in polyacrylamide gels of various concentrations, we calculated the molecular mass of the protein, which was equal to about 65,000. It is interesting to note that, in polyacrylamide gel in the presence of sodium dodecylsulfate, the preparation was characterized by a mobility equal to the mobility of ovalbumin with a molecular mass of 45,000, which agrees with published data and, evidently, is a result of conformational transitions of proteins under the effect of the detergent [7].

The amino-acid analysis of the preparation of pesticin I revealed the absence of cystine. The results of the amino-acid composition of the purified preparation given in the table in comparison with Brubaker's data with respect to pesticin from the cells of A1122 strain of *Y. pestis* indicate the similarity of the studied parameters of proteins from different strains.

#### Conclusion

1. Pesticin I, which is a monomer protein with a molecular mass of 65,000, was isolated from the cells of the EV strain of *Y. pestis* and purified.
2. The pesticin preparation is represented by three immunologically identical alpha-, beta- and gamma-forms having isoelectric points equal to 5.49, 5.88 and 6.21, respectively.
3. The pesticin I preparation does not contain cystine.
4. With respect to the studied physicochemical parameters, the preparation of pesticin I is close to pesticin from the cells of A1122 strain of *Y. pestis*.

5. The obtained antipesticin serum can be used for developing serological methods of testing pesticin in various biological objects.

Comparative Content of Free Amino Acids in  
Hydrolyzates of Pesticini

Amino Acid	Content of amino acids (in mol) converted to 100 mol of obtained amino acids	
	Pesticin I from A1122 Strain	Pesticin I from EV76 Strain
Tryptophan	0.5	Not determined
Lysine	6.3	5.7
Histidine	1.6	1.9
Arginine	5.7	6.2
Aspartic acid	15.6	14.4
Threonine	5.9	5.3
Serine	8.6	8.8
Glutamic acid	7.7.	9.9
Proline	4.2	2.7
Glycine	8.1	8.5
Alanine	4.5	4.3
Cystine	0	0
Valine	6.3	6.2
Methionine	1.8	1.9
Isoleucine	6.2	7.3
Leucine	8.0	8.7
Tyrosine	3.7	3.3
Phenylalanine	5.2	5.0

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CSO: 1840/1592

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EFFECT OF VIRAZOLE ON ANTIVIRAL ACTIVITY OF POLY(G)·POLY(C) AND OTHER  
POLYRIBONUCLEOTIDE INTERFEROGENS

Moscow ANTIBIOTIKI in Russian Vol 29, No 6, Jun 84  
(manuscript received 24 Nov 83) pp 450-453

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[Abstract] Chemotherapy agents that increase the antiviral effect of synthetic polyribonucleotide inductors of interferon include virazole. The present article reports on its effects on poly(G)·poly(C) and analogs in cultures with vesicular stomatitis or Sindbis viruses, as well as on tick-borne encephalitis in mice. The relationship of virazole effects to increased induced synthesis of interferon was also studied. The virazole used was from the US firm "ICN Pharmaceuticals, Inc.", while other preparations were of domestic Soviet origin. Results indicated that virazole increased the antiviral effects of not only poly(G)·poly(C), but also of its analogs poly(G,I)·poly(C) and poly(G,A)·poly(C). Virazole alone did not prevent death of test mice from tick-borne encephalitis, nor did it have any effect on interferon content in the blood of the test mice. Accordingly, the authors conclude that further study of the nature of virazole's role in reducing viral diseases must be carried out. Figures 3; references 8: 3 Russian, 5 Western.  
[1587-12131]

UDC 615.357:577.175.82].038.07

CLINICAL-EXPERIMENTAL STUDY OF NEUROPEPTIDES

Moscow VOPROSY MEDITSINSKOY KHMII in Russian Vol 30, No 3, May-Jun 84  
pp 47-51

CHAZOV, Ye. I., TITOV, M. I., VINOGRADOV, V. A., SMAGIN, V. G. and  
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[Abstract] The only peptides widely used in medicine today are diagnostic substances. The presence of synthetic peptides in large quantities has allowed the creation of highly specific methods of radioimmune and immuno-cytochemical analysis. It is clear today that regulatory peptides form

an independent and well-developed system of regulation of biological functions with a broad spectrum of activity. The nature of influence of regulatory peptides on various functions depends essentially on the paths of their liberation from producing cells. The classical endocrine path involves liberation of peptides from the endocrine cells directly into the blood. An intermediate type of action of peptides on the target cells in the evolutionary plan is the paracrine or neurocrine path of action. Finally, the paracrine path is important in the visceral organs. Action mediated by the central nervous system is less probable. In studying the prospects of clinical utilization of neuropeptides one must also consider the variety of populations of peptide receptors in target cells. Selectivity appears only in low concentrations, the substance interacting with other types of receptors in larger concentrations. The use of peptide preparations in large doses will yield the least specific final effects, producing large numbers of side effects. Long-term effects are also now being reported following administration of neuropeptide regulators. The tactics of therapeutic application of regulatory peptides must consider the specifics of the actions of these substances. They are suitable for use in clinical treatment of internal diseases by occasional administration in small, optimal doses. References 20: 3 Russian, 17 Western. [1539-6508]

UDC 615.214:577.175.82].015.4:612.822.1

MODULATING EFFECT OF SHORT PEPTIDES ON MONOAMINERGIC CEREBRAL PROCESSES AS BASIS OF THEIR PSYCHOTROPIC EFFECT

Moscow VOPROSY MEDITSINSKOY KHMII in Russian Vol 30, No 3, May-Jun 84  
pp 56-63

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[Abstract] Studies performed at the author's institute in recent years have revealed high and specific psychotropic activity of a number of short peptides. Several original compounds with psychoactivating effects are promising for clinical testing. Among others, an immunoglobulin fragment, the tetrapeptide taftsin, and a number of its analogs have been studied. The authors have studied the influence of peptides on behavior and emotional reactions following systemic (intraperitoneal) administration. The effect of a number of short peptides on the emotional-behavioral reaction of cats was studied under conditions of individual and group behavior. Clear psychotropic effects were observed which can be qualified as psychoactivating, tranquilizing and anti-depressive. The interaction of the substances with a number of membrane receptors in the brain was studied. The modulating effect of the peptides on neuromediator processes in the brain qualifies as a type of regulatory action influenced by the status of the transmitter system. Evaluation of the interaction of peptides with membranes, particularly with membrane lipids, is worthy of more attention. The authors have demonstrated that short peptides in physiological concentrations change a number of characteristics of model phospholipid membranes. References 23: 14 Russian, 9 Western. [1539-6508]

UDC 612.821.2-06:612.822.1:577.175.82+  
615.357:577.175.82].03:616.89-008.  
46-085

EFFECT OF NEUROPEPTIDES ON MEMORY. SOME PROSPECTS FOR CLINICAL UTILIZATION

Moscow VOPROSY MEDITSINSKOY KHMII in Russian Vol 30, No 3, May-Jun 84 pp 63-68

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[Abstract] The results of the authors' studies lead to several conclusions concerning the mechanism of action of neuropeptides on the functions of memory and indicate the promise of their use in clinical practice. The first part of the work was performed on 107 chronic alcoholics without manifest memory disorders. Lysil-vasopresin was administered intranasally 16-30 units. Vasopresin caused some increase in attention level. The greatest results were obtained in word memory tests. Vasopresin caused a significant increase in long-term memory among persons with the poorest memory. Vasopresin caused an increase in the amplitude of the electroencephalograms and some increase in a index. The effect was more strongly expressed, the lower the level of the a index before the preparation was administered. In the second part of the work, vasopresin was used to reinforce a conditioned negative reflex to alcohol among the patients involved in creation of persistent negative motivation with respect to alcohol by development of a conditioned reflex between the taste of alcohol and the vomiting reflex caused by administration of apomorphine. Vasopresin resulted in a 50% stronger development of the conditioned alcohol rejection reflex. Figures 4; references 14: 6 Russian, 8 Western.

[1539-6508]

INDUSTRIAL TOXICOLOGY OF METALS OF PLATINUM GROUP

Prague ZHURNAL GIGIYENY EPIDEMIOLOGII MIKROBIOLOGII I IMMUNOLOGII in Russian Vol 28, No 1, 1984, pp 15-23

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[Abstract] Study of toxic activity of various platinum compounds and platinoids in experiments on animals to reveal toxicity parameters, features of toxic activity and maximum permissible levels of various platinum compound metals at work posts involved 3000 laboratory animals. These compounds produce a wide range of toxic effects on the body and produce occupational diseases of the respiratory tract, dermatoses and eye diseases. Chronic effects noted in the experiments included animal weight loss, reduction of blood hemoglobin level, disturbance of the protein-forming function of the liver, reduction of blood cholinesterase activity, carbohydrate metabolism and lipid metabolism disturbances, kidney function impairment and development of glomerulonephritis. Data concerning distribution of the metals in animal

organs and elimination of them from the body are presented. The fact that the toxicity of platinum metals correlates with the structure of the atoms and their electron shells was reported to be important in predicting toxicity of new compounds of platinoids and their danger in production. Maximum permissible concentrations of compounds of platinum and platinoids were recommended. References 9: 7 Russian, 2 Western.

[1581-2791]

PHYSIOLOGY

UDC 612.66:612.43

VITAMINS AND PERIODIC FASTING AS POSSIBLE FACTORS IN EXPERIMENTAL PROLONGATION OF LIFE

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 30, No 1, Jan-Feb 84  
(manuscript received 28 Jun 83) pp 16-24

KONOPLYA, Ye. F., DUBINA, T. L., ZELEZINSKAYA, G. A., DYUNDIKOVA, V. A.,  
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[Abstract] Quantitative and qualitative changes in food and nourishment are viewed as having a direct bearing on longevity. The present article reports on experimental study of a restricted-calorie, high vitamin diet, as contrasted to diets with restricted caloric intake only. The test Wistar rats were given no food, but free access to water for 3 days, followed by 15 grams of curds on the 4th day, half regular rations on the 5th day and regular rations on the 6th day. While one group was fed on this regimen only, another group had the same diet regimen with addition of multivitamins. Later study of tissues of the liver, heart, brain, skeletal muscles and aorta for enzyme activity showed varying effects. Malatedehydrogenase (MDG) in the liver increased in activity, while "NADN"-DG activity in the brain fell by 16%. Vitamin supplementation brought increased succinate-DG activity in the liver and reduced SDG in the brain. Glycogen content increased only after the longer-term, 9-course variant of the experiment. While 4 courses of dieting brought increased biological maturity, this was prevented by the vitamins. While fasting for 6 days caused considerable protein loss and changes in enzyme activity, restoration of diet corrected such shifts within 5 days. In combination with vitamins, the regimen of periodic dieting brought an apparent reduction in biological age of the test rats. Figures 3; references 28: 18 Russian, 10 Western.

[778-12131]

EFFECT OF TRANSMERIDIANAL MOVEMENT ON ADAPTATIONAL DYNAMICS OF FATTY ACID COMPOSITION OF BLOOD PLASMA IN HEALTHY HUMANS

Moscow VOPROSY PITANIYA in Russian No 4, Jul-Aug 84  
(manuscript received 4 May 83) pp 26-29

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[Abstract] Human adaptation to extreme cold and preservation of homeostasis under such conditions form the topic of this article. Indigenous peoples of the Soviet far north have been shown to utilize exogenous lipids in metabolism. The dynamics of this adaptation were studied in 230 healthy individuals of the Trans-Baikal region who had migrated from the Ukraine or Byelorussia. Within 3 months of arrival, they showed typical fatty acid deficiencies, with increased monoenic acids and reduced linolenic and arachidonic acids. Increases in saturated lipids was regarded to be a consequence of restructuring of energy metabolism with intensive oxidation of poly-unsaturated fatty acids. Use of a methylmalonate approach for oxidizing polyenic fatty acids, with supplementary fatty acids with double bonds was found to prevent carboxylation of pyroracemic acid. These recommendations are aimed at preventing ischemic heart ailments and atherosclerosis among the migratory population of the region. References 21: 14 Russian, 7 Western.  
[850-12131]

UDC 612.27:612.12:612.22:612.26:612.66

RESULTS OF STUDY OF HYPOXIA PROBLEMS

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 30 No 3, May-Jun 84  
(manuscript received 12 Jan 84) pp 355-362

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[Abstract] This is a survey of studies of hypoxia conducted in Kiev by various research institutes; the studies included the effects of hypoxia on the brain, myocardia and blood of white rats, the effects of acute circulatory hypoxia and oxygen deficiencies, and numerous other consequences of exposure, especially in mountainous areas. Ontogenetic aspects and oxygen circulation by the blood have received special attention in order to find preventive procedures as well as methods of treatment. Growth factors at high altitudes, related to blood oxygenation, have been investigated from the standpoint of anatomical shunting and irregularities in ventilation and perfusion relationships. The negative effects of middle and advanced age on oxygen adaptation have been demonstrated to be related to slowed circulation. Research has included mathematical modelling of blood circulation and oxygen transport processes. It has been shown that in hypoxia, synthesis of those fractions of

hemoglobin that have great affinity to oxygen increases, while with hyperoxia the opposite occurs. One of the results of research in this field has been formulation of new perceptions of secondary tissue hypoxia resulting from the discrepancy between oxygen supply and demand in tissues. Hemic hypoxia, which has previously received little attention, is a new direction for research in hypoxia. References 57 (Russian).

[777-12131]

UDC 612.4.018

#### ACHIEVEMENTS AND PROSPECTS IN STUDY OF MOLECULAR MECHANISMS OF HORMONE ACTION

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 30, No 3, May-Jun 84  
(manuscript received 4 Jan 84) pp 302-309

KOMISSARENKO, V. P., TRON'KO, N. D., MINCHENKO, A. G. and BEZDROBNYY, Yu. V.,  
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[Abstract] Study of hormone regulator action and its role in metabolism has become a cardinal direction in endocrinology particularly in relation to major advances in understanding of steroids, peptides and other hormones. As a rule, hormones act in conjunction with specific receptors on cell surfaces or within them. Surface-acting hormones are peptides such as insulin and corticotropin, etc. A second group first enters cells, then begins its activity. The present article reports on molecular mechanisms of glucocorticoid hormones such as corticosterone, hydrocortisone and, to a lesser degree, cortisone, as these substances penetrate cell membranes to interact with mitochondrial DNA, through such mechanisms as molecular hybridization of RNA with cloned DNA fragments and electrophoresis of mitochondrial poly(A)-containing RNA in an agar gel under denatured conditions. A double-phase system of biosynthesis with preliminary strengthening of RNA biosynthesis was followed by, first, a decline in RNA movement in the cytoplasm and then, after 2 hours, an increase in such activity. Further post-transcription and post-translation processes were also observed which require further study. Insulin action began with initial reaction with specific receptors on plasmatic membranes followed by both nuclear and mitochondrial biosynthesis within cells. Antagonistic effects were also recorded as glucocorticoids suppressed insulin activity, although the opposite was not observed. Further study of receptors, chemical features, the role of nuclear and of mitochondrial gene interaction, and other mechanisms is needed.

Figure 1; references 38: 8 Russian, 30 Western.

[777-12131]

OLIGOPEPTIDES IN EMOTIONAL REACTION MECHANISMS

Moscow VOPROSY MEDITSINSKOY KHMII in Russian Vol 30, No 3, May-Jun 84  
pp 15-23

SUDAKOV, K. V.

[Abstract] Oligopeptides have been found to participate in mechanisms of synaptic transfer of excitation in the central nervous system, in the mechanisms of motivation, memory, sleep, in the implementation of inherent and acquired behavior acts based on negative or positive emotions. In order to study the participation of oligopeptides in emotional reactions, the author studied behavioral and somatic-autonomic manifestations of negative and positive emotional reactions evoked in animals by direct electrical stimulation of emotiogenic structures in the hypothalamus. Stimulation of emotiogenic centers in the hypothalamus usually caused an increase in muscular tonus, respiration frequency, and pressor or pressor-depressor vascular reaction, accompanied by bradycardia. Oligopeptides were administered into the lateral cerebral ventricles through specially chronically-implanted cannulae with tip diameter 0.2 mm. The studies showed that angiotension II at 0.015-0.05 µg/kg blocks behavioral manifestations and has no significant influence on autonomic components of the avoidance reaction. Bradykinin in the same doses facilitates behavioral manifestations of the avoidance reaction, activating and suppressing autonomic manifestations of the reaction. Substance R at 0.015-0.03 µg causes an increase in the latent period of the avoidance reaction. A peptide causing δ sleep at 0.01-1.5 µg/kg blocks behavioral and autonomic manifestations of the avoidance reaction. β-endorphin at 0.3-3 µg/kg blocks, at 15-35 µg/kg facilitates the somatoautonomic manifestations of the avoidance reaction. Renin at 10-30 µg/kg facilitates the cardiovascular reaction upon electrical stimulation of the ventromedial hypothalamus. The experiments showed that background application of angiotension II to 52 neurons of the parafascicular complex of the thalamus resulted in activation of 14 neurons, inhibition of 11 and no reaction in 27. After electrical stimulus of 52 neurons, 21 were activated and 7 were inhibited, while 24 failed to react. The data indicate that under experimental emotional stress conditions there is an increase in the number of reticular formation neurons in the midbrain which respond to microionophoretic action of angiotension II by inhibition. Angiotension II therefore causes an increase in the activating reactions of neurons of the sensomotor cortex and parafascicular nuclei of the thalamus and an increase in inhibition reactions of neurons in the reticular formation of the midbrain. Figures 9; references 20: 15 Russian, 5 Western.  
[1539-6508]

UDC 615.276.4:577.112.853].015.46

## IMMUNOACTIVE PEPTIDES

Moscow VOPROSY MEDITSINSKOY KHMII in Russian Vol 30, No 3, May-Jun 84 pp 23-31

IVANOV, V. T., Institute of Bioorganic Chemistry imeni M. M. Shemyakin,  
USSR Academy of Sciences, Moscow

[Abstract] A brief study is presented of the basic trends of work on immunoactive peptides developed at the Institute of Bioorganic Chemistry. N-acetylglucosaminyl-( $\beta$  1-4)-N-acetylformyldipeptide (GNDP) has been found to have a broad spectrum of biological activity. The problem of the mechanism of action of GNDP and its analogs is far from solution. However, more detailed pharmacologic study of substances in this class in order to produce preparations to be used in clinical practice such as vaccination, nonspecific protection from infection and cancer chemotherapy is continuing. The thymus serum factor has various effects including induction of T-cell markers on T-cell precursors, stimulation of T-cell immunity, stimulation of T-helpers and strengthening of T-suppression. The  $\delta$  sleep inducing peptide (DSIP) was discovered in 1977 as a possible endogenous sleep inducing factor and soon revealed to have a number of neurotropic effects. Recent data indicate that it is an endogenous factor increasing the resistance of animals to stress effects, which may be a factor normalizing sleep. The administration of endogenous neuropeptides or their chemical analogs has been demonstrated experimentally to prevent stress disorders in the system of natural antitumor resistance. The peptides have very high activities. Figures 13; references 29: 6 Russian, 23 Western.

[1539-6508]

UDC 612.821.2

## DYNAMICS OF INCORRECT VOLUNTARY RESPONSES AND INTER-HEMISPHERAL EEG RELATIONSHIPS

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 10, No 2, Mar-Apr 84  
(manuscript received 28 Dec 82) pp 260-264

FEDOTCHEV, A. I., Institute of Biological Physics, USSR Academy of Sciences,  
Pushchino on the Oka

[Abstract] Voluntary human responses in various psychophysiological and electrographic parameters are constantly being studied, particularly in relation to hemispherical brain relationships. The present article reports on electrographic reactions that preceded incorrect responses, in comparison to correct voluntary responses. The test group consisted of children 8-9 years of age and adolescents 15-17 years old. After acclimatization, the subjects were instructed to recall and compare various light stimulants, signaling if the stimuli were equal. EEG records of right and left hemispheres, skin electric

activity and ECG records, speech and movement responses were compiled for correct and wrong responses. Forty-two wrong reactions in 13 of the children, and 50 in 16 of the adolescents, were analyzed by computer. Results showed that a brief shift in interhemispherical functional asymmetry accompanied false responses, with electrical activity in the left hemisphere dominating over that in the right side. The most pronounced changes were in alpha-rhythms of 15-17-year-olds, and in alpha- and tetra-rhythms of occipital zones of children. The latent period of verbal responses also increased during incorrect responses. These changes were coordinated with the moment of false responses and quickly returned to normal, indicating the dynamic nature of interhemispherical functional asymmetry in the human brain. Figures 2; references 19: 16 Russian, 3 Western.  
[793-12131]

UDC 612.821+62.5

REFLECTION OF LATERALIZATION OF SOUND STIMULI IN EVOKED POTENTIALS OF HUMAN BRAIN

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 10, No 2, Mar-Apr 84  
(manuscript received 4 Oct 82) pp 265-271

NDINGA, A., TAIROV, O. P. and KULIKOV, G. A., Leningrad State University imeni A. A. Zhdanov

[Abstract] A major component of sensory organization in conscious acts is determination of spacial relationships of sensory signal sources and the body's orientation toward them. The present article reports on reflections of induced potentials of the human brain in lateralization of sound images created by introducing interaural retardation between dichotically presented sound stimuli. The 11 subjects of both sexes were given sound stimuli from the right or left combined with a centrally-located sound. The sounds were clicks generated by electric impulses with intervals of 0.5 ms. EEG records were made using silver electrodes fastened with collodion. Results indicated that subjective localization of sound images in space was reflected in features of mean induced potentials in the human brain. Specific binaural reactions in associative brain systems were judged to be connected to final stages of the organization of orientation reaction, such as determination of acoustical distance to the sound source. The prevalence of the central sound channel in such reactions is attributed to its key importance in forming such orientational reactions. Figures 5; references 21: 10 Russian, 11 Western.  
[793-12131]

PUBLIC HEALTH

ORGANIZATION AND QUALITY OF HOSPITAL CARE IN USSR

Moscow PRAVDA in Russian 16 Aug 84 p 3

[Article by V. Sisnev, deputy chief of department, USSR Committee of People's Control, and V. Petrunek, sector chief: "There is no Concern of Greater Importance--Medical Services Being Inspected"]

[Text] Tens of thousands of different therapeutic and preventive institutions, as well as more than a million physicians are guarding the health of the Soviet people. Hospitals occupy a prominent place in health care. About one-quarter of the nation's entire population receives medical care in hospitals. It is not a simple matter to see to it that it is properly organized and of good quality. Here, as in no other area, not only much professional knowledge and experience are required, but constant sensitivity to the sick individual.

Still, for the sake of objectivity, let us state that the achievements of the hospital service of public health could be more perceptible, if its material base and capacities were used more efficiently. This is indicated, in particular, by the recent check made by the USSR Committee of People's Control of organization of the therapeutic process in hospitals of some autonomous republics and oblasts of RSFSR, the Ukraine and Kazakhstan.

It was learned that not all patients are hospitalized early enough, yet in many instances there are vacant beds. For example, in Chechen-Ingush ASSR, this would have made it possible to hospitalize 18,000 patients without additional expense in the last 2 years. On the whole, the annual increase in "throughput capacity" of hospitals in the Russian Federation per day, by improving efficacy of treatment, makes it possible to restore the health of an additional 270,000 people. This is tantamount to building hospitals with a total of 12,000 beds. In Karaganda Oblast, 25,000 people could have received treatment using beds that were vacant in 1983.

There are many reasons for such a situation, but they all amount essentially to organizational flaws. For it is a known fact that no patients, with the exception of emergency cases, are discharged or admitted on weekends [days of leave]. A check made in 10 city and rayon hospitals in Dzhambul Oblast revealed that in 3 months alone, almost 5000 bed-days were lost for this reason. As compared to the figures for weekday hospital admissions, 1/26th the number were admitted on weekends at the Uzhgorod Oblast Hospital and 1/10th at central rayon hospitals.

The unemployed, who could be treated as outpatients at polyclinics, are given priority in scheduled hospitalization due to the lack of control and, sometimes, downright connivance on the part of administrators of local health agencies. At the republic hospital alone (Chechen-Ingush ASSR), about 3000 such unemployed citizens of employable age were treated in 1 year. At the inspected central rayon hospitals of this autonomous republic, we found up to 40% such cases. Many of them did not require medical care at all. Yet blue- and white-collar workers with exacerbations of chronic diseases wait for long periods of time to be admitted to a hospital.

Again, we must discuss the fact that continuity is not practiced everywhere by far between polyclinics and hospitals with regard to patient examination and treatment. This sometimes leads to protraction and, sometimes, failure to complete a full course of therapy, and it has an adverse effect on health care economics, since millions of rubles are spent daily for hospital upkeep. We found that 82% of the patients had not been worked up prior to hospitalization in central rayon hospitals of Karaganda Oblast, and this applied to 59% in Mordovian ASSR.

As before, the diagnostic offices are not operating full time in all facilities. Poor use is being made of medical equipment. During the inspection, equipment worth almost a million rubles was standing idle in the hospitals of Transcarpathian, Karaganda and Kherson oblasts, as well as Chechen-Ingush ASSR alone.

We cannot remain silent about the epidemic-control conditions at the hospitals. People's inspectors discovered quite a few wards and entire departments, as well as receiving rooms, where there are gross infractions of sanitary and hygienic rules, which sometimes leads to intramural infections.

These and other flaws became possible, to a significant degree, because of the lack of exactingness on the part of local and republic-level health care agencies, unsatisfactory supervision of performance of medical institutions. Not infrequently, they replace organizational work with speechifying and preparation of numerous administrative documents. For example, the Ukrainian Ministry of Health forwards up to 400 different documents annually to oblast health departments. Many of them are put to inspection, but poorly implemented locally. This is to be blamed primarily on those responsible for organizing intramural medical service--A. Zelinskiy, first deputy minister, and V. Kozlyuk, chief of the main administration for therapeutic and preventive care.

The Kazakh Ministry of Health and deputy minister M. Gribanov, who is in charge of this sector of work, do not nip in the bud the incorrect actions of administrators of oblast health departments and hospital chief physicians. Not infrequently, the apparatus of this agency is idling. In the last 3 years its staff traveled 31 times to Dzhambul and Karaganda oblasts; questions of quality and organization of medical care were discussed 16 times at meetings of the board of the ministry, and numerous times in its subordinate departments. But things have not improved. On the contrary, the number of complaints is growing.

The USSR Ministry of Health is still faced with quite a few problems pertaining to improvement of performance of the hospital service. By far not everything has been done to adhere to the procedure, which was established by the ministry itself, for admitting and servicing patients. And how are medical records kept? Patient charts are made out in such a way that it is simply impossible sometimes to offer a qualified expert opinion on their basis. There are several statutes concerning hospital work that have long since become obsolete.

True, the USSR Ministry of Health held an expanded meeting of the board, on the basis of the results of this inspection, at which a stinging rating was given to the disclosed flaws and punishment meted out to those who were to blame for them. In particular, reprimands were made to A. Zelinskiy, first deputy minister of Ukrainian Ministry of Health, and M. Gribanov, who holds the same title in the Kazakh Ministry of Health, and strict reprimands were made to A. Kulagin, Mordovian minister of health, and P. Kamyshnikov, minister of health of Chechen-Ingush ASSR.

The USSR Ministry of Health has elaborated and is implementing concrete steps to improve organization and raise the standards of the therapeutic process in hospitals. Use of hospital beds, strict demand—admission of unexamined patients, quality of continuous therapeutic and diagnostic process, introduction of new effective therapeutic agents and methods have been placed under special control.

Further improvement of hospital care requires much attention and assistance on the part of local soviet and economic bodies. In particular, this applies to problems such as new construction and proper upkeep of existing hospital resources, continuous supply of foodstuffs, linens, needed stock, and housing provisions for medical personnel.

It should be stated that the local party committees displayed a principle-minded and business-like attitude toward the results of the inspection, and they were strict in making those to blame responsible for the flaws.

Questions of improving medical care are acquiring importance also in connection with the decision of annual dispensary services to all of the population of our country. In the course of the planned work, no doubt there will be new groups found that require hospital care. Strictest adherence to the established procedure for patient hospitalization and proper organization of the diagnostic-therapeutic process at all of its stages will help solve this complicated problem.

10,657  
CSO: 1840/1100

## NEED FOR SICK LEAVE TO DIMINISH

Moscow TRUD in Russian 18 May 84 p 3

[Article by G. Klyuchakov (TRUD correspondent), Poltava]

[Text] No one likes to be sick. But, if a trauma is sustained on the job, or your child gets a bad cold or disease, whether you like it or not you take sick leave. Each day, polyclinics issue hundreds and thousands of sick-leave certificates. There is no need to explain how much this costs the national economy.

An experiment, in progress for more than a year already, that is being conducted by the AUCCTU [All-Union Central Council of Trade Unions] has as its goal to comprehensively reduce absenteeism due to disability and make worker groups, trade-union committees and public health agencies more involved in lowering it.

How have things been done heretofore? There is concern at the enterprises for the health of people; working conditions have improved, preventive measures have been intensified and the funds thus saved are returned to the state treasury, to the "general pot." We find that there are no material incentives to display initiative. In Latvia, Altay Kray, Vitebsk, Leningrad, Lvov, Penza, Perm and Poltava oblasts things are now being done differently. Determination was made of planned indicators with consideration of current actual work days lost due to sick leave and their annual reduction. Funds are handed over on the basis of these indicators. It was possible to save some of them, 80% of this sum is left on the account of the oblast trade-union council for use as incentives for groups that deserve them. They are now able to establish their own "health fund," for payment of prizes, purchase of medical equipment and additional travel passes to health centers.

A recent conference in Poltava confirmed entirely the benefit of this effort. In Vitebsk Oblast, for example, the temporary disability indicator was lower than in the plans as a result of the efforts made by coordination councils, which included representatives of party, soviet and trade-union agencies, as well as enterprise management and physicians. The people of Lvov succeeded in lowering significantly the loss of work time due to caring for sick children. At the Poltava Fluorescent Lamp Plant, dietetic meals are provided for all who need them thanks to the "health fund." Drugs are issued free of charge to those who need them. The staff of plant children's combines receive prizes only

if their charges are seldom sick. All this made it possible to keep each plant worker on the job for 120 days over and above the plan.

The participants at this conference discussed, of course, not only the achievements of the experiment, but problems that have not yet been solved. One of them is the difficulty in acquiring medical and sanitary-hygienic equipment. Evidently, the USSR Gosplan, along with trade-union bodies, should consider providing the necessary limits for "health funds." In addition, it would be desirable to build up some reserve of travel passes for outstanding workers at the Central Council for Management of Trade-Union Resorts. A. Anchupans, secretary of the Latvian Republic Trade-Union Council offered some interesting suggestions: to include the morbidity indicator in socialist competitions. At present, it is taken into consideration in Latvia on all levels, from worker groups to ministry.

An experiment is an experiment, and it cannot tolerate stagnation. New versions of solutions and different approaches are being tested with due consideration of specific local conditions.... This work is planned for an arbitrary five-year period, to the end of 1987. Ultimately, its main achievement will be our good health.

10,657  
CSO: 1840/827

## BRIEFS

NEW PESTICIDE HANDLING BOOK--Every year, when spring comes, intensive work starts for agricultural aviation. Already hundreds of An-2 aircraft crews have started to work. Unfortunately, it was learned, in the course of checks made by medical workers of the Civil Aviation Administration, that the pilots and aircraft technicians who are involved in air-borne chemical dusting still underestimate safety measures when working with pesticides. The "Methodological Guide for Physicians and Engineers on Labor Safety Practices for Enterprises of PANKh [expansion unknown] Safety Practices and Production Sanitation in Air-Borne Chemical Dusting Work" has just come off the press. This book was authored by the staff of the All-Union Scientific Research Institute for Use of Civil Aviation in the National Economy. This methodological guide gives the classification and toxicity of pesticides for man. It discusses biological agents for protection of plants and mineral fertilizers. Much attention is given to rules for rendering self- and mutual help. Details are given about preventive measures that must be implemented when performing airborne dusting work using chemicals. Sanitary and hygienic specifications are given for setting up and outfitting operational centers and organizing safe conditions. This guide gives a list of chemical and biological agents allowed for use in agriculture in 1982-1985 according to classes of hazard. We believe that this guide will help medical personnel in training aircraft and helicopter crews for airborne chemical spraying work. Only by following the recommendations of physicians and adhering to safety rules will the pilots and technicians be able not only to perform their work plan well, but to preserve their health. [By V. Lamzutov, physician] [Text] [Moscow VOZDUSHNYY TRANSPORT in Russian 6 Sep 84 p 3] 10,657

UDC 612.336.31-06:613.953.11

COMPARATIVE ANALYSIS OF STATE OF INTESTINAL MICROFLORA IN NEONATES WITH BOTTLE FEEDING USING VARIOUS MILK MIXTURES

Moscow VOPROSY PITANIYA in Russian No 4, Jul-Aug 84  
(manuscript received 19 Apr 83) pp 29-33

LUGOVSKAYA, R. K., LADODO, K. S., BARASHNEVA, S. M. and PABERZA, P. Ya.,  
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[Abstract] Feeding characteristics have a profound impact on development of intestinal microflora and related health among neonates. The present study compares the effect of breast feeding, considered to be ideal, with that of various formulas of milk and additives including the acidophilic "Malyutka" mixture and it, in combination with a new fatty composition and "Detolakt". A test group of 58 clinically healthy, full term babies from well-to-do homes with Apgar scores of 8-10 were given varying diets. Examination of feces at the start of the test period and after 22-60 days indicated that as time went on, unadapted artificial diets led to significant deterioration of anaerobic microflora populations in the intestines; aerobic microflora were affected 53.3% of the time, compared to 43.1% divergences in the control group. These results point to the need for further improvement of artificial formulas for neonates that will not damage intestinal microflora. References 18: 13 Russian, 5 Western.

[850-12131]

RADIATION BIOLOGY

UDC 575.24:576.851.48

ESCHERICHIA COLI K-12 MUTANTS SHOWING ENHANCED RESISTANCE TO IONIZING RADIATION

Moscow GENETIKA in Russian Vol 20, No 5, May 84  
(manuscript received 30 May 83) pp 746-755

BRESLER, S. Ye. (deceased), VERBENKO, V. N. and KALININ, V. L., Leningrad  
Institute of Nuclear Physics imeni B. P. Konstantinov, USSR Academy of Sciences

[Abstract] Escherichia coli K-12 AB1157 was used in an analysis of resistance to ionizing radiation of its Gam<sup>r</sup> strains carrying additional mutations which affect recombination or the SOS repair system. Exposure to lethal doses of gamma-irradiation of the radiosusceptible wild type (AB1157) and its radio-resistant variants (Gam<sup>r</sup> + additional mutations) showed that when the mean number of genomes per cell decreases due to preradiation incubation of dnaA46 mutants at 43°C, radioresistance remains unaffected in strains AB1157 dnaA46 and Gam<sup>r</sup> 445 dnaA46, while that of strains Gam<sup>r</sup> 444 dnaA46 falls to the level of strain Gam<sup>r</sup> 445 dnaA46. Introduction of mutations recA56, recB21 or lexA3(lexA102) into the genomes of Gam<sup>r</sup> 444 and Gam<sup>r</sup> 445 renders them as radiosusceptible as the wild type (AB1157). The additional mutations recF143 and recA439 also reduce radioresistance of Gam<sup>r</sup> 444 and Gam<sup>r</sup> 445, but to a lesser extent. Mutation recAo98 (constitutive operator) increases the resistance of all lexA3 containing strains but not to the level exhibited by lexA<sup>+</sup> variants. In addition, mutations that interfere with the induction of the SOS repair system in lexA3 and recA430 variants potentiate gamma radiation-induced degradation of DNA in strains Gam<sup>r</sup> 444 and Gam<sup>r</sup> 445. Studies on postradiation DNA degradation in AB1157 and Gam<sup>r</sup> mutants indicated that the latter possess a constitutive inhibitor of degradation that acts jointly with the RecA protein to limit the exonuclease activity of RecBC nuclease. Figures 6; references 31: 4 Russian, 27 Western.

[1575-12172]

UDC 575.24:576.851.48

ESCHERICHIA COLI K-12 MUTANTS WITH ENHANCED RESISTANCE TO IONIZING RADIATION.  
PART 4. RECOMBINATION IN Gam<sup>r</sup> MUTANTS

Moscow GENETIKA in Russian Vol 20, No 5, May 84  
(manuscript received 30 May 83) pp 756-759

BRESLER, S. Ye., KALININ, V. L. and LANEYEVA, N. I., Leningrad Institute of Nuclear Physics imeni B. P. Konstantinov, USSR Academy of Sciences

[Abstract] Comparative studies were conducted on the recombinational potential of wild-type, highly radiosusceptible Escherichia coli K-12 AB1157, moderately radioresistant strain Gam<sup>r</sup> 445, and highly ionizing-radiation resistant strain Gam<sup>r</sup> 444. Conjugational studies showed that in Gam<sup>r</sup> 444 the frequency of inheritance of the long F plasmids ORF1 (pure<sup>r</sup>-tsx<sup>r</sup>-procC<sup>r</sup>-lac<sup>r</sup>) and F14 (ilv<sup>r</sup>-argE<sup>r</sup>) is lower than in the wild type and Gam<sup>r</sup> 445. These plasmids contain the hot-spots of RecF-dependent recombination. Furthermore, in Gam<sup>r</sup> 444 the frequency of chromosomal mobilization in the Gam<sup>r</sup> 444 F<sup>r</sup> donor was 100-fold greater than for the Gam<sup>r</sup> 445 donor, with integrative suppression of the temperature-sensitive mutation dnaA46 also enhanced. On the basis of these observations, the Gam<sup>r</sup> 444 mutant appears to be quite similar to the recBC sbcB mutant in which recombination is of the RecF type. References 7: 3 Russian, 4 Western.  
[1575-12172]

UDC 575.24:599.323

MUTAGENICITY OF TRITIUM FOR GERM CELLS OF MALE MICE. PART 2. TRITIATED WATER- AND GAMMA RADIATION-INDUCED GENETIC DAMAGE IN SPERMATOGONIA

Moscow GENETIKA in Russian Vol 20, No 5, May 84  
(manuscript received 18 Apr 83) pp 782-787

POMERANTSEVA, M. D., BALONOV, M. I., RAMAYYA, L. K. and BILKINA, G. A., Institute of General Genetics, USSR Academy of Sciences, Moscow; Institute of Radiation Hygiene, RSFSR Ministry of Health, Leningrad

[Abstract] Outbred, 10-15 week old, male mice were used to assess the effects of Cs-137 gamma irradiation or a single intraperitoneal administration of tritiated water (THO) on genetic defects in spermatogonia following a gonadal dose of 1, 2, or 4 Gy. Follow-up on the animals for up to 8 months showed that the frequency of reciprocal translocations in the THO mice after exposure to 1, 2, or 4 Gy was, respectively, 0.4, 1.1, and 2.5 (per 100 cells). The corresponding frequencies with an equivalent gamma radiation dose were 0.5, 0.9 and 1.2; with both types of radiation the frequencies of such translocations were significantly above the control baseline level. The calculated RBE for tritium was seen to increase from a value of 1 at 1-2 Gy, to a value of 2 at 4Gy. Both types of radiation showed a dose-dependent increase in the frequency of anomalous sperm heads, as well as a rise in the frequency of dominant lethal mutations. However, in the latter case THO was almost nine- to ten-times as potent in mutation induction as the corresponding dose of gamma radiation. Figures 1; references 15: 12 Russian, 3 Western.  
[1575-12172]

UDC 576.312.33:612.014.482:599.8

STABLE CHROMOSOMAL REARRANGEMENTS IN MONKEY SOMATIC CELLS FOLLOWING SINGLE IRRADIATION

Moscow GENETIKA in Russian Vol 20, No 5, May 84  
(manuscript received 23 Nov 82; in final form 7 Apr 83) pp 835-840

KOSICHENKO, L. P., Scientific Research Institute of Experimental Pathology and Therapeutics, USSR Academy of Medical Sciences, Sukhumi

[Abstract] Cytogenetic studies were conducted on rhesus monkeys to assess the long-term sequelae of a single Co-60 gamma-irradiation in terms of chromosomal rearrangements in somatic cells. Studies on the monkeys 0.25-6 and 10-18 years after irradiation (154.8-167.7 mC/kg, LD<sub>70-90</sub> equivalent) showed that there was a statistically significant ( $p < 0.01$ ) increase in the frequency of single ( $f = 0.88$ ) and paired ( $f = 1.12$ ) fragments in bone marrow cells in the 0.25-6 year time frame. Within the 0.25-6 year time span the frequency showed a gradual decrease due to clonal selection and elimination. However, in the 10-18 year postirradiation time span the total number of rearrangements was greater than at 6 years, due to a qualitative change in the spectrum of alterations with predominance of monotypic changes. The latter consisted essentially of symmetrical chromosomal translocations and pericentric inversions, with the former alterations predominating in a ratio of 2-3:1. Figures 1; references 19: 5 Russian, 14 Western.

[1575-12172]

VIROLOGY

BIOLOGICAL PROPERTIES OF STRAINS OF TICK-BORNE ENCEPHALITIS VIRUS ISOLATED IN NATURAL FOCI OF EAST OF RUSSIAN PLAIN

Prague ZHURNAL GIGIYENY EPIDEMIOLOGII MIKROBIOLOGII I IMMUNOLOGII in Russian  
Vol 28, No 1, 1984, pp 33-45

PCHELKINA, A. A. and MEDVEDEVA, G. I., Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow

[Abstract] A comparative study of biological properties of strains of tick-borne encephalitis virus, isolated from the blood and liquor of human patients in endemic foci in the eastern part of the Russian plain (Kirov Oblast) included 69 strains isolated from *Ixodes persulcatus* ticks, 62 strains from clinically-confirmed tick-borne encephalitis patients and 56 strains from patients with asymptomatic forms of the disease. Comparative studies of laboratory animals, including white mice, golden hamsters, suckling guinea pigs and other mammals, were combined with serological studies. All isolated strains from Kirov Oblast were antigenically identical to the Sof'yin strain isolated in the Far East, constituting 1 species of tick-borne encephalitis pathogen. There was assumed the existence of 2 variants of tick-borne encephalitis virus which are encountered under different ecological conditions. They are the eastern variant of the virus (including the Sof'yin strain and strains from Kirov Oblast) and a western variant of tick-borne encephalitis.

References 24: 19 Russian, 5 Western.

[1581-2/91]

CONFERENCES

FIRST SOVIET-INDIAN SYMPOSIUM ON NEUROPHYSIOLOGY

Moscow USPEKHI FIZIOLOGICHESKIKH NAUK in Russian Vol 15, No 2, Apr-Jun 84  
pp 111-112

SOSNOSVSKIY, A. S., ROSLYAKOVA, N. A. and SUDAKOV, K. V.

[Abstract] This chronicle report summarizes topics presented at the symposium held 11-12 October 1983 in Tsakhkadzor, ArSSR and devoted to mechanisms of motivation, emotion and emotional stress, through cooperation between the Institute of Normal Physiology imeni P. K. Anokhin, USSR Academy of Medical Sciences, and the All-India Institute for Medical Research, New Delhi. Emotional stress and increasing human resistance to extreme situations, studies of animal reactions to extreme stress and its effects on neuromediating brain centers, emotional features of catecholamine metabolism, and non-medicinal approaches to stress control were among the topics presented. Other topics included psychoendocrine changes in women with various hormonal dysfunctions, the role of the cerebellum in psychosomatic disturbances, heat-cold therapy to promote relaxation, avoidance reaction conditioning in test rats, dynamics of various brain structures on antigen stimulus and immune reactions, and herbal medications found in the USSR and India. Comprehensive experimental studies of motivation and emotional responses were emphasized in many reports at the symposium.

[779-12131]

## MISCELLANEOUS

### BIOLOGICAL SCIENCE AND NATIONAL ECONOMY

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA BIOLOGICHESKAYA  
in Russian No 4, Jul-Aug 84 pp 84-86

[Article by N. N. Voronina, scientific secretary of Department of Biological Sciences, Kazakh Academy of Sciences]

[Text] A session of the General Meeting of the Department of Biological Sciences, Kazakh Academy of Sciences, convened on 28 March 1984. Its participants included scientists from scientific institutions of this department, Kazakh SSR, Eastern Department of VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin, instructors from the Kazakh State University imeni S. M. Kirov, Alma-Ata Zooveterinary Institute, Kazakh Agricultural Institute, Alma-Ata Medical Institute, Kazakh Pedagogic Institute imeni Abay and several other institutes, as well as specialists from ministries and agencies, representatives of government, party and public organizations.

The opening remarks were delivered by Ye. V. Gvozdev, vice-president and academician of the Kazakh Academy of Sciences.

A. N. Ilyashev, academician-secretary of the Department and academician of the Kazakh Academy of Sciences, delivered the main paper, "Achievements of Institutions of the Department of Biological Sciences, Kazakh Academy of Sciences, in 1983." He observed that a review of the achievements of scientific institutions of the Department is being made in a climate of high labor and political enthusiasm in the nation, due to the historical decisions of the June (1983) and November (1983) plenums of the CPSU Central Committee concerning pressing problems of ideological and mass-scale political work of our party.

The speaker called attention to the fact that our scientists, like all of the Soviet people, received the decisions of the special February (1984) Plenum of the CPSU Central Committee with great inspiration; this plenum demonstrated vividly the unity, solidarity and continuity of the political course of the party toward further improvement of the routes of building fully developed socialism in our country, as well as the consistent implementation of the decisions of the 26th CPSU Congress.

Commenting on the importance of the basic research conducted last year in the area of soil science and improvement, zoology and botany, microbiology and

virology, molecular biology and biochemistry, genetics of agricultural plants and livestock, physiology of plants, animals and man, A. N. Ilyaletdinov stressed the fact that the scientific teams at the biological institutes under the academy are conducting investigations pertaining to a rather extensive list of topics to implement the Food Program in the USSR. We refer to participation in the All-Union integrated scientific and technical program, "Sugar" (Institute of Botany and Institute of Microbiology and Virology), development of technology for recovery of dry bacterial enzymes and setting up their industrial production at the Vyshnevolotskiy Enzyme Plant under the USSR Glavmikrobioprom [Main Administration for the Microbiological Industry], as well as introduction of the biological method of stabilizing natural demi-sec wines and aromatization of strong wines (Institute of Microbiology and Virology), introduction of cross-bred and fine-wool sheep for mutton and wool purposes, newly developed breeds of swine and cattle, proposal of a method for increasing fertility of livestock and a method of transplanting zygotes in the area of sheep farming (Institute of Experimental Biology), development of scientific bases for optimum use of wild and game animals (sayga, elk, jackal), birds ("semirechenskiy" pheasant) and other animals (Institute of Zoology), as well as technology for production of canned melon juice and technology for planting and cultivating rice (Institute of Botany), recommendations for recovery of high-grade grain from cereal crops on the basis of biochemical research (Institute of Molecular Biology and Biochemistry), introduction of physiological methods for increasing livestock productivity (Institute of Physiology) and, finally, testing methods of increasing soil fertility by recultivating it, as well as improvement and various agrotechnical procedures (Order of Red Banner of Labor Soil Science Institute) and many others.

In his report, the academician-secretary dwelled on the performance of the Department Office, 11 scientific councils dealing with various biological problems and 10 scientific societies, which coordinate the research of 77 higher educational institutions and other agency organizations; he also commented on the large amount of work done by specialized councils for defense of doctoral (Institute of Microbiology and Virology) and candidatorial (Institute of Soil Science, Institute of Zoology, Institute of Botany, Institute of Physiology, Main Botanical Garden) dissertations. A. N. Ilyaletdinov exposed the shortcomings and oversights in the work of the Department and its institutions, with reference to coordination and integration of several agricultural problems of utmost importance, organization of patenting and licensing work; he mentioned the difficulties that are experienced when conducting scientific research, the material and technical base that is still inadequate, as well as insufficient availability of production space.

The following individuals participated in discussion of the above-described report: I. O. Baytulin, corresponding member of the Kazakh Academy of Sciences, director of the Institute of Botany; M. A. Proskuryakov, acting director of the Main Botanical Garden, doctor of biological sciences; Zh. U. Akhanov, acting director of the Order of Red Banner of Labor Institute of Soil Science, candidate of agricultural sciences; A. F. Kovshar', chief of laboratory for protection of rare and endangered animals, Institute of Zoology, doctor of biological sciences; B. N. Nikitin, chief of laboratory of animal biochemistry, Institute of Physiology, doctor of biological sciences.

I. O. Baytulin dwelled on the prospects for development of botanical science in our republic, which are aimed at deeper investigation of biology, ecology, anatomy and morphology of higher and lower plants, wise use and protection of the plant kingdom, as well as elaboration of proposals for organizing preserves and sanctuaries. Studies will be intensified and expanded in the area of physiology and genetics of agricultural plants by means of development of theoretical bases and practical procedures for controlling systems of regulation and optimization of physiological processes; significant increase in resistance and productivity of cultivars has been achieved.

M. A. Proskuryakov called attention to the need for further development of peripheral botanical gardens as a system that would permit "interpolation forecasts of the results of introduction in the main soil and climate regions of this republic." He expressed his confidence that the many years of intensive work to change to "interpolation forecasting" will be successfully completed.

An expanded decree was adopted by the session of the General Meeting of the Department pertaining to the keynote report. In its declarative part, mention was made of the scientific achievements in the area of basic research. For example, the Order of Red Banner of Labor Institute of Soil Science has made a forecast of changes in reclaimed condition of soil in the Asian part of our country; steps were elaborated to prevent adverse effects from lowering the level of the Aral Sea, and recommendations were offered on use of water after diversion of some of the run-off of Siberian rivers to Kazakhstan and Central Asia. The Institute of Zoology has finished a study of the Mesozoic and Cenozooid fauna and flora of Central Kazakhstan, South Altay and North Tyan-Shan; some unique paleozoological objects have been discovered; it was proven that cellular breeding of the muskrat is feasible, and there has been scientific validation of the efficacy of this method in muskrat breeding; studies have been made of several questions related to the biology of sarcosporidia and the extent of infection with this tissue protozoan of farm animals was determined. New data were obtained at the Institute of Microbiology and Virology concerning the primary structure of human influenza viruses, and a method was developed for disintegrating influenza virions using MESK detergent; a new method was proposed for ensilage of straw, which enhances significantly the nutritional value of feed. The Institute of Micro-Molecular Biology and Biochemistry investigated the properties and identified the distinctions of grain crop amylases, and it has offered recommendations for practical use of this enzyme in the bakery industry. Some of the patterns in the mechanism of plant salt-resistance were demonstrated at the Institute of Botany; it was shown that the inhibitory action of salts leads to a change in energy metabolism processes in plant cells. The Institute of Physiology obtained new data on physiology of contractile structures of mammary ducts and their lymphatic vessels in farm animals; the extent of involvement of lymph in regulating lipid metabolism was determined. At the Institute of Experimental Biology, there was continuation of studies of theoretical and applied aspects of zygote transplantation in pedigreed sheep breeding; sheep embryo formation up to the stage of eight bl. tomeres was effected using a newly developed method of culturing ova and fertilizing oocytes in tissue culture.

The decree also commented on the shortcomings and oversights in the work, as well as objective difficulties. The support that is still poor with regard to production space, experimental testing bases and hospitals for five institutes of the Department is one of the reasons that is holding back development of new promising directions of biological science and lowering the effectiveness of research. Not all of the Department's institutes are making full use of the Kaskelenskiy Sovkhoz as a base farm.

Having given its approval to the performance of scientific institutions and the Department Office, the General Meeting of the Department of Biological Sciences has decreed to enlist all of the scientific teams to participate in unfailing fulfillment of the decisions of the 26th CPSU Congress, 15th Congress of the Kazakh Communist Party, May (1982), June (1983), November (1983) and February (1984) plenums of the CPSU Central Committee, as well as decrees adopted by the party and government pertaining to acceleration of scientific and technological progress in the national economy, comprehensive development of basic and applied investigations in the area of biological sciences, immediate introduction of scientific advances to practical agricultural production and public health.

The scientific paper delivered by F. A. Polimbetova, corresponding member of the Kazakh Academy of Sciences, was heard with great interest; its title was "Resistance and Productivity of Wheat in the Zone of Reclaimed Land in Kazakhstan" and it was dedicated to the 30th anniversary of reclaiming virgin and long-fallow land.

N. D. Beklemishev, academician of the Kazakh Academy of Sciences, reported to the General Meeting on the scientific and scientific-organizational performance of Department members in 1983.

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